BBC · MASTER · ELECTRON · A3000 · ARCHIMEDES OCTOBER 1990 £1.60

BBC ACORN USER



BEEB MUSIC
Hybrid's Music 5000 system



PATTERN POWER
Kaleidoscope and Frieze reviewed



PRINT IT BIG!
Poster software for the Arc



REGULARS
8/32 bit hints
Games, Reviews



BRING IT HOME

Why kids should compute at home

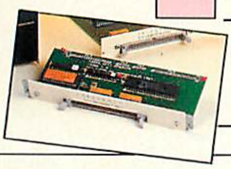
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THE WORLD OF LINGENUITY

More technology for less money

SCSI NEWS

HARD DRIVE - IMPROVED PERFORMANCE AND PRICE REDUCTIONS



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NEW PRICE	20MB HARD DRIVE £399.00 PLUS VAT	NEW PRICE	20MB HARD DRIVE £349.00 PLUS VAT
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SCSI DEVICES WITH A CAPACITY OF UP TO 1000 MB ARE AVAILABLE

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Snapshot allows the Archimedes user to digitise pictures in colour and realtime, using standard Video equipment.





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Snapshot is a full 12 bit digitiser with an enhanced real-time display. Sprites can be saved at a rate of up to 84 per minute, or raw image data can be processed with !Enhance (supplied with package).

SNAPSHOT £339.00 PLUS VAT

NEW PRODUCT

Colour Converter still available for those with Watford Digitisers. Ring for details

Contact your local dealer for further details about all Lingenuity Products.
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TALKS TO PIPEDREAM 3

For the first time, two Acorn applications can communicate with each other in real-time in the RISC OS environment.

HotLink Presenter includes all the features of Presenter II (the professional graphics programme which enables you to present your data graphics in bar, pie or line format) with the additional benefit that it can be updated automatically from Pipedream 3.

Updates are available for existing Presenter II and Presenter users, as well as site-licences for multi-station installations.



HOTLINK PRESENTER £49.95 PLUS VAT

NEW PRODUCT

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You've heard about Presenter Story - well now its available!

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- **PAL/Composite Video Monitors**
- **Analogue/RGB Monitors**
- **Video Walls**
- **Overhead projector displays**

Use your Archimedes or A3000 for that important presentation. You can change your presentation at a stroke in a few seconds - no more last minute panics getting new slides or acetates made. Presenter story is ideal for sales presentations, corporate presentations, training programmes, internal departmental presentations, or home or studio video application.

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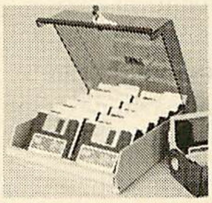
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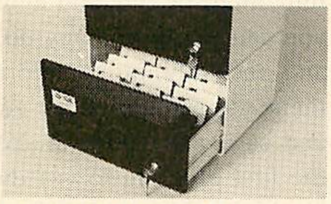
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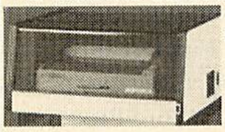
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• BUFFER RAM STATUS INDICATOR • BUILT IN COMMANDS: COPY, FORMFEED & PAUSE

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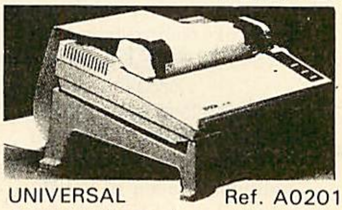
All parallel buffers have 36 pin female connectors as standard

PRINTER CONTROL CENTRE

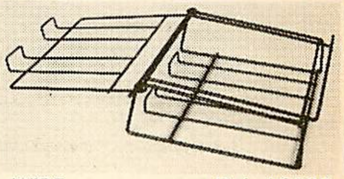
• SOFTWARE DRIVEN • KEYBOARD CONTROL

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YUS-25B for 130 col. printer. Ref. A0204 £32.50

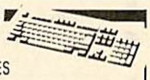
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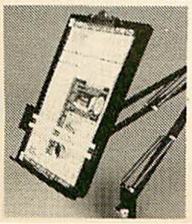
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KEYBOARDS



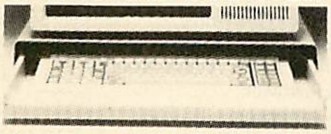
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*Please specify printer

BBC ACORN USER

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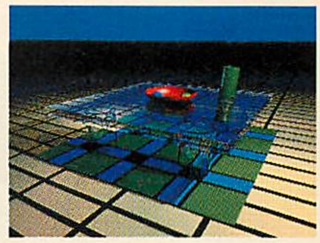
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BRINGING IT ALL HOME



Cover illustration by Paul Slater

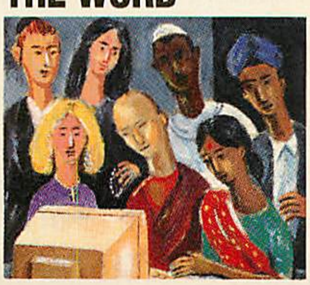
80
LIGHT LINES



127
GAME SHOW



66
SPREADING THE WORD



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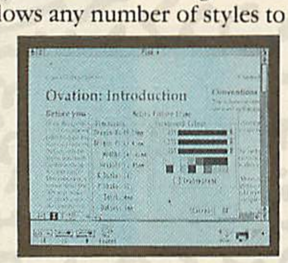
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A 'style' is the font, size, justification, leading, indent etc. of a piece of text. Ovation allows any number of styles to be defined, named and then applied to paragraphs at the press of a key. Styles may be re-defined at any time, and the changes will automatically flow through the entire document. In addition, local styles may be applied to any highlighted block by simply selecting the font, size, style and format from the menus.



Frame Handling

Ovation has many advanced frame features, such as linked text frames with auto-flow, repel text, definable frame borders and a step-and-repeat facility. Unique on the Archimedes, is our parent/child system for frames and lines. This system allows you to copy and paste frames with embedded child frames and lines, as single items. This allows diagrams, forms, tables etc. to be copied or moved with ease.

The Instinctive DTP

Ovation is supplied with a tutorial and complete user guide, although you probably won't need to refer to it very often. Ovation makes full use of the RISC OS multi-tasking environment to provide a formidable array of features that are easy to learn and instinctive to use. A quick reference card is also included, which lists all the keyboard and mouse short cuts.

Other Features

- Multi-tasking/multi-documents
- No hardware protection
- Full WYSIWYG display with variable view
- Fast built-in spelling checker (requires 2Mb)
- Printer drivers for Epson, PostScript, LaserJet, and Integrex printers
- Import Draw and Sprite files. Features include: scale, crop, fit-to-frame
- Master pages for each chapter
- Cut/copy/paste using clipboard
- Multiple columns
- Find and replace
- Automatic headers and footers
- Supplied with 4 outline fonts (13 faces)
- Variable (& fractional) font sizes 1pt to 500pt
- Supports coloured text, frames and borders
- Stylesheets and customised start-up
- Definable frame borders
- Linkable text frames
- Supplied with full range of clipart
- Variable size, style and colour lines
- Manual and auto hyphenation (requires 2Mb)

And much, much more......



Excellent Value

At only £99 plus VAT Ovation represents better value for money than any other DTP on the Archimedes/A3000. But don't be mislead by price. We are confident you will be impressed, and offer a full refund if not completely satisfied. Educational discounts and site licences are available.

Only ***£99.00***

(+£3 carriage) ***plus VAT***

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SUPPORT FOR STUDENTS

Acorn, the National Union of Students Services and Barclays Bank, are running a computer purchase scheme for students.

Aimed primarily at teacher training students, it gives them 'free' use of a BBC A3000 Learning Curve package. They pay when they are earning.

They can buy The Learning Curve with colour monitor at £977.85, or an Archimedes 420/1 DTP at £1683, with 2Mb of Ram and a 20Mb hard disc.

Details can be obtained from the NUSL catalogue, or NUS services on (0457) 868003.

● Acorn has extended the Teacher Support Scheme which allows teachers to buy Acorn equipment at reduced rates.

Through Mercantile Credit, teachers can buy the Learning Curve package or an Archimedes 420/1. The Learning Curve with colour monitor and stand is £999.25, or £39.99 monthly over 24 months with an £126.75 deposit. The Archimedes 420/1 costs £1491.60 or £1744.60 with colour monitor, with a similar finance deal.

Contact Acorn on (0223) 245200.

NEW ARC WP

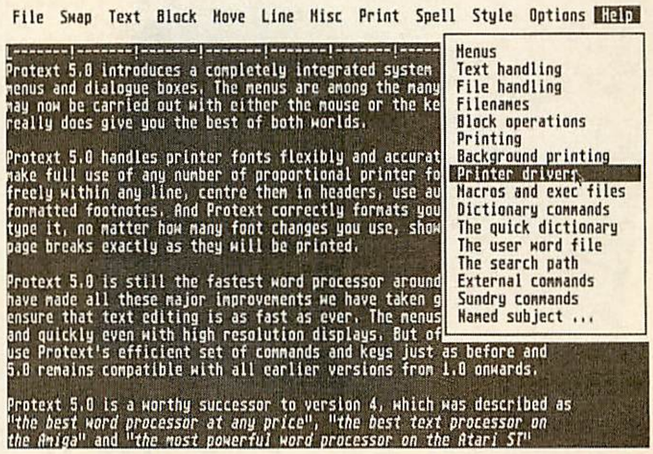
A popular wordprocessing package – which is currently available for the Amiga, ST and IBM PC compatibles – is also to be released for use on the A3000 and Archimedes machines.

Protext from Arnor is a wordprocessor with a 110,000-word Collins dictionary using phonetic word suggestion. Version 5.0 is to be released on a variety of formats this October.

According to Arnor's managing director, Mark Tilley, the company has decided to introduce the package for the Archimedes 'owing to increased demand over the past couple of years'.

Arnor is launching *Protext* to test the profitability of the Archimedes market. Tilley said: 'If demand is high enough, we'll upgrade *Protext* to make it Risc OS compatible, as well as releasing other products for the Archimedes.'

Protext version 5.0 is written in the high-level language C, and is being ported to the Archimedes using Acorn's Ansi



C compiler. Although the initial release does not comply with the Risc OS recommendations for Wimp management, Tilley pointed out that Acorn proved to be very helpful.

'In fact, they offered us more assistance than some companies I could mention,' he said.

The package is more of a traditional wordprocessor when compared to packages such as *First Word Plus*. *Protext* features menus which are pulled down from a selection bar at the top of the screen, unlike the Risc OS pop-up variety. This way of doing things is common on other machines such as the Mac, Amiga or PC.

Some of the standard features include editing up to 36 files at a time, split-screen editing, programmable mailmerge and macros.

Protext will be available from October for £149.95. More information about it is available from Arnor on (0733) 68909.

ACORN COMES TO AID OF THIRD PARTY

Acorn is to stop developing applications software and instead will give more support to third-party software companies.

To date, Acorn has released packages including *Acorn DTP* and *First Word Plus* for the Archimedes.

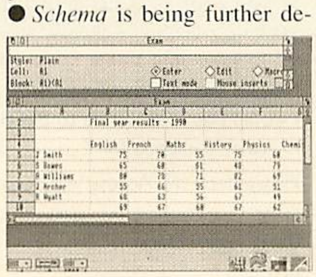
The company was due to release *Schema* (see last month's issue) and *Expression* – a spreadsheet and document processor – but these projects have been given to outside software companies for further development.

Explaining Acorn's decision, Michael Page, Acorn's corporate communications manager, said: 'We have trail-blazed with packages in the past and we now feel that there are enough independent software vendors out there to support users' needs.'

He confirmed that more of Acorn's resources would be targeted at software support.

'Not only are we able to help with technical assistance, but we are also in a position to put developers in touch with software publishers.'

● *Schema* is being further de-



veloped and distributed by Clares. The company is currently fine-tuning the program and hopes to demonstrate the package at the *BBC Acorn User* show on September 7-9.

Features include built-in graphics and a script language for customisation.

Schema will cost £129.95 (including VAT), or £114.94 for educational orders.

For more details contact Clares on (0606) 48511.

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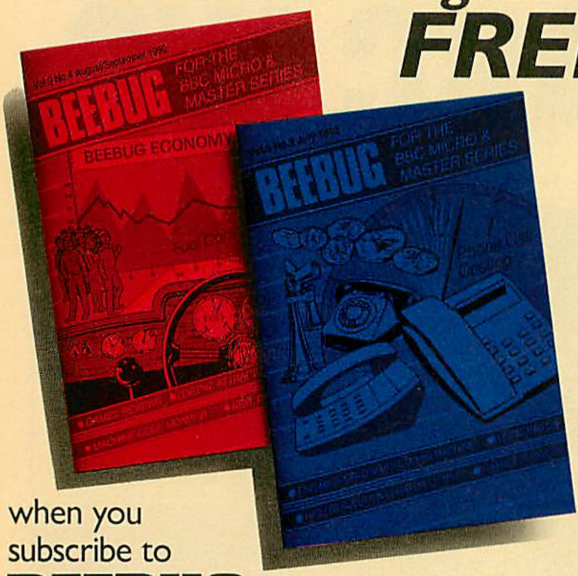
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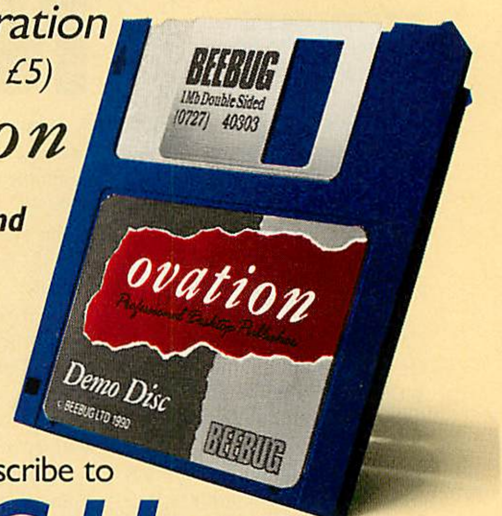
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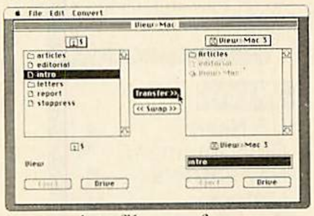
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A VIEW TO A MAC

Human Computer Interfaces has released a package that allows document conversion between Acorn machines and the Apple Mac, and vice versa.

Viewmac 3 performs file transfer from any Acorn machine to a Mac over a serial link. The Mac downloads an



appropriate file transfer program to the Acorn machine. Various file formats can be converted to suit the host machine.

Wordprocessors supported include *Wordwise*, *View*, *Interword*, *1st Word Plus*, *Pipedream* and *View Professional*.

The package costs £79.35 for educationalists (incl. VAT). Registered users of Viewmac 2 can upgrade for £51.75. HCI is on (0223) 314934.

LEARNING CURVE ADVANCES



Acorn has launched a new version of the Learning Curve package.

Based around an A420 machine, the package features a hard disc and 2Mb of Ram, plus all the software that is included in the original A3000-based Learning Curve.

This includes Software Solutions' *Genesis*, the *DR Dos* PC emulator, *First Word Plus* and a guide to the National Curriculum.

Enhancements include:

- Acorn's DTP package.
- Additional *Genesis* application discs that feature the A420, personal applications and a slide show application.
- A modified video, which features TV personality Fred Harris demonstrating the use of the A420, rather than the A3000.

All applications are prepared on the hard disc, thus saving users the bother of configuring the system.

The new system, launched at the *BBC Acorn User* show, costs £1299 – a saving of £200 on the stand-alone cost of the A420.

Needless to say, the price of the new package will have a knock-on effect on the A420 and other Acorn machines in the range. According to Simon Lovesey, Acorn's consumer marketing manager, the new Learning Curve bundle has been introduced 'to give the consumer more choice.'

Acorn is promoting its Learning Curve packages with a special 'test flight' promotion.

More details can be obtained from Acorn on (0223) 245200.

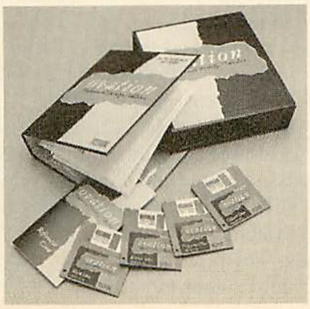
GIVE 'EM A HAND

Beebug's *Ovation* DTP system for the A3000/Arc is now available. You can buy a demonstration disc for £5 (returnable when you purchase the full package).

Ovation costs £98.90 plus VAT to educational users). Beebug Ltd is on (0727) 40303.

- Also out is a pre-release version of *Tempest*, the long-awaited DTP package from Clares. Clares is on (0606) 48511.

Watch for reviews of both packages in next month's issue.



CARRYING THE SCAN

Irlam has launched Image, a mini-flatbed 24-bit colour scanner at £689.

The motorised unit (made by Sharp) accepts postcard-size originals and scans them at 200dpi, or other software selectable resolutions.

Data is fed into the computer via a high-speed serial interface. A file is then rendered into a 256-colour sprite using Acorn's *ChangeFSI* processing software, and the resulting images can be used with art packages such as *!Paint* and *!DTP*.

Clares has released an A4 Epson flatbed colour scanner which was developed for the company in New Zealand.

The 24-bit scanner costs £1799, which includes software and a bidirectional Centronics podule interface.

The unit features resolutions from 75 to 400 dots per inch and can produce mono, grey scale or colour images.

David Clare told *BAU* that his company may also be launching a smaller, cheaper colour scanner based on the Sharp engine, as used by Irlam Instruments.

Contact Irlam on (0202) 841234 and Clares on (0606) 48511.

- On the software front, Irlam is currently developing a package that will convert a scanned image into a vectorised copy of a sprite which will be *!Draw*-compatible.

Irlam hopes to demonstrate the software at the *BBC Acorn User* show.

The package is expected to cost less than £100.

STOP PRESS – NEW ARC A540

Acorn is using the BBC Acorn User Show as the official launch-pad for its new Arm 3-based machine, the A540 (previewed exclusively in last month's issue). Price is £3444, including VAT, and availability is mid-October. Watch out for a full review in *BAU* soon.



NEWS IN BRIEF

● Racing Car Computers has released an Eprom programmer for the Archimedes 400 series and A3000.

The software interface is fully Risc OS-compatible and multi-tasking.

Two different interfaces are available – parallel and serial and the units cost £149.95 each.

More details are available from RCC on (0279) 812496.

● Aleph One Ltd has reduced the price of its Arm 3 upgrade.

The price of a 33Mhz Arm 3 upgrade has been reduced to £512. Aleph One is on (0223) 811679.

● *Squirrel* from Digital Services is a database in which all fields are constantly indexed automatically.

The package has been designed for both multi-user and stand-alone use.

A single user version costs £129, with Econet and site licences available.

Digital Services is on (0705) 210600.

DIARY DATES

***October 7.* Beebug open day, Hatfield Road, St Albans, Herts. Contact Beebug on (0727) 40303.**

***September 24-28.* Business Computing '90, Earls Court, London. Business and trade exhibition only. Contact: Montbuild on 071-486 1951.**

***October 20.* Big Ben Club Open Day, Community Centre De Kiekmure, Tesselschadelaan 1, Harderwijk, Netherlands.**

Activity groups for education, genealogy and Dos Plus. Contact: Harry Linsen, Gommerskerspel 24, 2151 RA NIEUW-VENNEP, Netherlands. Tel: (31)2526-72385.

***December 6-9.* Computer Shopper 1990 Show, Wembley Conference Centre, London. Contact: Cape Cowley Associates on 061-480 9811.**

LASER DIRECT ENHANCED

Computer Concepts has launched a successor to its Laser Direct system for the A3000/ Archimedes.

The new system is based on the Canon LPB-4 four-page per minute laser printer and is capable of producing 600x600 dpi under software control – twice the normal resolution.

The system is supplied as an expansion board and software for £403. Users are required to buy their own Canon LPB-4, which they can also obtain from Computer Concepts at £1507.

Printer driver software that is compatible with Risc OS offers a choice of resolutions from 300 to 600dpi. The software uses an outline font rendering system that allows fonts to be scaled to any size, thus taking advantage of the increased resolution.

The printer itself does not print at 600x600 but, by increasing the rotation speed of the mirror used to focus the laser onto the drum, dots are printed at various sizes and an acceptable effect is obtained (see example).





300 x 300 600 x 600

Computer Concepts can be contacted on (0442) 231632.

ARC AIDS GAMES

Sisteme, the French company which specialises in producing coin-operated arcade games, is using the Arm 2 chip in its games consoles.

To date, the company has sold its arcade games in the French, UK and US markets, with the latter being the most lucrative.

Sisteme develops all of its games with the Archimedes, releases coin-op versions and then sells cut-down computer versions later.



Sisteme's Francois-Yves Bertran told *BBC Acorn User*: 'We get all our Arm chips directly from VLSI (which manufactures the Arm chip) and develop the game using several software utilities, including our own sound package.'

The arcade games also use the MEMC and VIDC chips and can accommodate up to 8Mb of Rom.

The games (four to date) are completely written in machine code, and they make no use of Risc OS routines to achieve optimum speed.

A feature on Sisteme will appear in the November issue of *BAU*.

ANOTHER WINNER!

Since publishing the last *BAU* reader survey questionnaire in March, we have been busy looking at your replies.

Our thanks to those of you who sent in ideas, which ranged from using micros for amateur radio through to garden design. We hope to incorporate many of them in future issues of *BAU*.

Meanwhile, the prize of an A3000 for the best idea – for a series of articles based on an interactive project – goes to Mr R Baker of London SE18.

Congratulations to him and thanks to everyone who sent in suggestions.

OOPS!

● Two errors appeared in the eight-bit ray tracing program in the September issue. Line 230 should read:

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230 NEXT:NEXT
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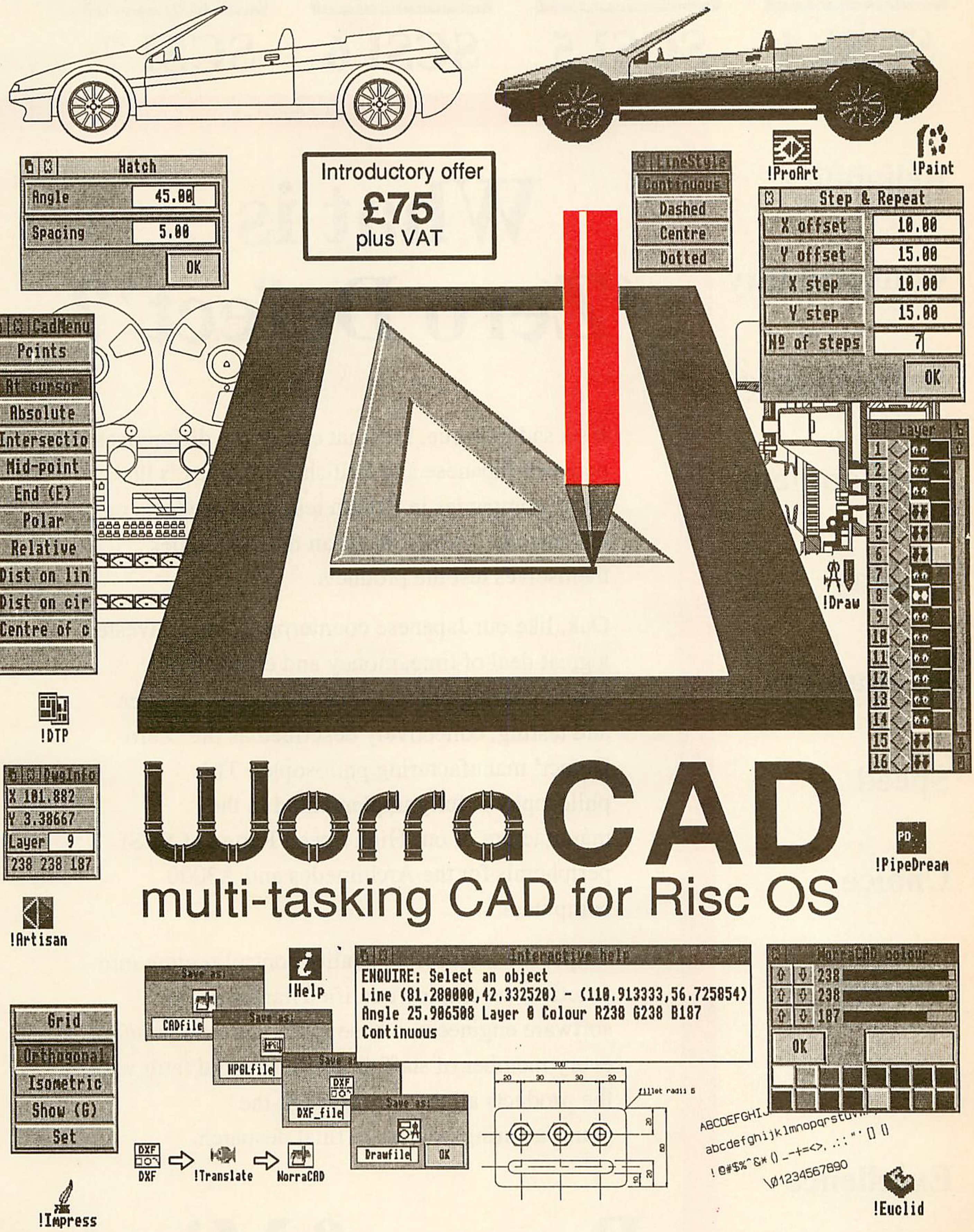
and line 1270 should have read:

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1270 fb%=fb%+1
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● The Laser Direct and Arclaser comparison in the last issue stated an incorrect price difference between the two systems.

The price difference is £100, not £200 as mentioned.

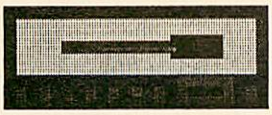
Top Drawer for your Desktop



All WorraCAD drawings on this page were created on a 1Mb A3000

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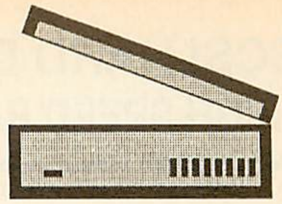
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CD :0



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Each Oak product for the Archimedes and A3000 computers is individually inspected at every stage of manufacture. Only those that pass inspection go on to receive a soak test, which is then followed by a final inspection and test prior to packing in cartons and internal foam packaging, specially designed to ensure that the product reaches the customer in perfect condition.

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HDINARC45SC	45Mb	495.00
HDINARC80SC	80Mb	699.00
HDINARC100SC	100Mb	925.00
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External SCSI Hard Disc with Controller Card for all Archimedes 310/400 series computers. Comes complete with controller card, connecting cables, backplates, 'T' piece and screws. Housed in a metal case colour matched to the Arc. with switch mode power supply and DC brushless fan.

HDEXARC20SC	20Mb	535.00
HDEXARC45SC	45Mb	655.00
HDEXARC80SC	80Mb	859.00
HDEXARC100SC	100Mb	1085.00
HDEXARC200SC	200Mb	1459.00
HDEXARC300SC	300Mb	2375.00
HDEXARC512SC	512Mb	2995.00

Additional External SCSI Hard Disc Drive. Up to 3 additional drives can be added to the Oak SCSI controller making 4 hard discs in total. For the Archimedes A3000, 310 and 400 series.

HDEXARC20SCA	20Mb	435.00
HDEXARC45SCA	45Mb	555.00
HDEXARC80SCA	80Mb	759.00
HDEXARC100SCA	100Mb	985.00
HDEXARC200SCA	200Mb	1359.00
HDEXARC300SCA	300Mb	2275.00
HDEXARC512SCA	512Mb	2895.00

A3000 External Hard Disc Drive with Controller Card. Comes complete with controller card housing, connecting cables. Drive unit housed in metal case, colour matched to the A3000 with switch mode power supply and DC brushless fan.

HDA3EX20SC	20Mb	535.00
HDA3EX45SC	45Mb	655.00
HDA3EX80SC	80Mb	859.00
HDA3EX100SC	100Mb	1085.00
HDA3EX200SC	200Mb	1459.00
HDA3EX300SC	300Mb	2375.00
HDA3EX512SC	512Mb	2995.00

A3000 External Monitor Bridge Mounted Hard Disc Drive with Controller Card. Comes complete with controller card housing, connecting cables. Drive unit housed in monitor bridge, colour matched to the A3000 with switch mode power supply and DC brushless fan.

HDA3BEX20SC	20Mb	565.00
HDA3BEX45SC	45Mb	685.00
HDA3BEX80SC	80Mb	889.00
HDA3BEX100SC	100Mb	1115.00
HDA3BEX200SC	200Mb	1489.00

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All Oak hardware is produced under a 'zero defect' quality control regime to ensure the highest possible levels of reliability.

MAGNETO-OPTICAL DRIVE

560 Mb SCSI Magneto-optical drive external unit complete with SCSI controller card, data cartridge and cables. Appears as winchester drive to Archimedes.

MAGOPT560	560Mb	3800.00
MAGOPTDISC	data cartridge	300.00

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Removeable high speed cartridge hard disc drives (real hard discs, not slow bernoulli type) Housed in a metal case colour matched to the Arc. with switch mode power supply and DC brushless fan. 42 megabytes capacity per cartridge. One cartridge included in price. 'SC' denotes card included, 'SCA' denotes card excluded.

RDEXARC42SC	A310,A400	1185.00
RDA3EX42SC	A3000	1185.00
RDEXARC42SCA	A310,A400	1085.00
RDA3EX42SCA	A3000	1085.00
RD42CART	disc cartridge	99.00

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SCSI TAPE STREAMERS

SCSI Tape Streamer with desktop software to allow easy and versatile backing up and restoring of data from SCSI and ST506 winchesters, networks etc. Comes complete with all cables. Housed in a metal case colour matched to the Archimedes with switch mode power supply and DC brushless fan.

TS60SC (inc card)	60Mb	1099.95
TS150SC (inc card)	150Mb	1354.00
TS60SCA (exc card)	60Mb	999.95
TS150SCA (exc card)	150Mb	1254.00
TAPE60 cartridge	60Mb	24.95
TAPE150 cartridge	150Mb	27.95

GIGABYTE TAPE DRIVE

R-DST technology providing exceptionally reliable backup of one gigabyte on a tiny DAT cassette. Ideal for image processing, experimental data backup etc.

TSGIGA (inc card)	1Gb	2995.00
TAPE1000 cassette	1Gb	35.00

ST506 HARD DISC DRIVES

Archimedes A410 Internal Hard Disc Drive for use with 'on- board' ST506 winchester controller. Comes complete with mounting chassis, screws, connecting cables and easy to follow fitting instructions.

HDINARC20ST	20Mb	199.00
HDINARC40ST	40Mb	315.00
HDINARC47ST	47Mb	399.00

Additional External ST506 Hard Disc Drive for A310, A400 Series and R140 computers. For use in conjunction with the 'on- board' or podule based ST506 controller. Comes complete with all cables and connectors to allow neat connection to rear of machine. Housed in its own metal case with switch mode power supply and DC brushless fan.

HDEXARC20ST	20Mb	349.00
HDEXARC40ST	40Mb	524.00
HDEXARC64ST	64Mb	765.00
HD64 (for R140)	64Mb	795.00
Add on drives for SJ Fileserver		POA

A3000 MONITOR STAND

Steel monitor bridge unit colour matched to A3000. Allows access to on off switch and floppy drive.

A3E10	21.00

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PDT - Parametric Design Tool	359.00
PDT - Upgrade PDT release 1 to 2	45.00
PDT - Annual upgrade fee	45.00
WorraCad - Risc OS 2D Draughting	75.00
Worra Plotter - Plotter driver for !Draw	29.95
Worra Battle - Real time 3D Tank Battle	14.95

All prices exclude VAT and delivery

Delivery charges :

External Hard Discs/Tape Streamers	15.00
Internal Hard Discs	10.00
SCSI Card	3.50
Software	1.00

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Tel: 0532 502615
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VISA



NEWS IN BRIEF

Research into the use of CD-Roms formed part of a two-year project in Hertfordshire schools investigating ways of developing the use of IT in school libraries.

The findings have been written up by Shirley Matthews, county IT librarian for the Schools Library Service, and published as a British Library report.

***CD-Roms in School Libraries* is available from The Advisory Unit, Endymion Road, Hatfield, Herts AL10 8AU. It costs £8.**

● L'Ensouleiado Software has an unpronouncable name and a range of inexpensive language programs and databases, particularly in French and Spanish.

Its packages cater for different abilities. It also produces a selection of history software. A variety of formats are catered for, including Beebs and Arcs.

Contact it at Old Brackenlands, Wigton, Cumbria CA7 9LA.

● *Honeypot* is a new curriculum file for primary technology from Resource. Pupils get to know the imaginary village of Honeypot and its inhabitants as they move through the program.

The accompanying materials and teachers' notes allow planning, designing and making activities.

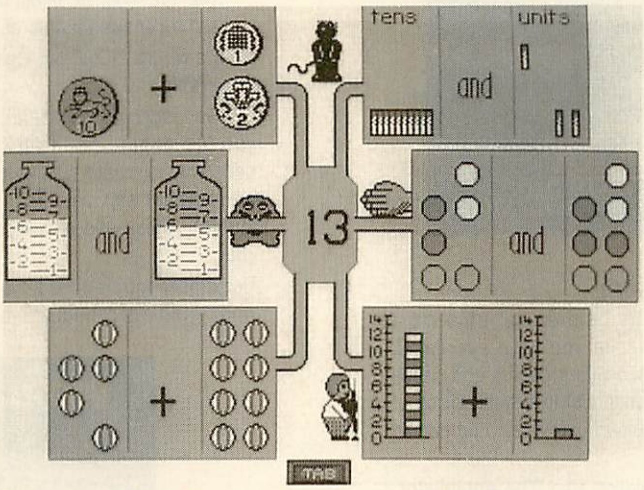
The software runs on the Archimedes/A3000 and Resource can be contacted at Exeter Road, Doncaster, South Yorkshre DN2 4PY.

● Storm Software's titles *Ollie Octopus' Sketchpad* and *Amazing Ollie* are now available for the Archimedes.

The first aids counting and number recognition. The second is based on shape and colour. They are aimed at children from four years.

Both packages cost £13.95 and Storm Software is at Beth House, Poyntington, Sherborne, Dorset.

COGENT IDEAS



The ever-prolific Sherston Software has published yet another new package and, since Sherston's Bill Bonham has sent us a cute little screen shot, we'll feature it here. Connections is designed to support the maths National Curriculum at levels 1 and 2. Children simply have to alter the contents of a set of windows to make true connections between different maths activities. It costs £25 and Sherston's address is Swan Barton, Sherston, Malmesbury, Wiltshire SN16 0LH.

Cogent Software is a small operation, typical of many educational software companies. It is run by ex-teacher Mick Ellis who started to develop his own computing solutions when he became heavily involved in pastoral work. Other people found his programs useful and so he decided to leave the profession and set up his own business.

He has two basic products: a curriculum auditing package, which is about to be launched, and an established monitoring and reporting program.

The *Curriculum Auditing System* (Ellis believes in straightforward names) enables staff to map the skills which are being imparted to, and used by, students within departments or across the whole curriculum.

Although on the face of it the package is an administrative aid, Mick stresses that he intends it for use by classroom teachers.

It provides a picture of a school's curriculum which reflects what has been taught, for example in the past academic year, and thus allows sophisticated planning to take place for the following year. In terms of the National Curriculum and fulfilling English targets in, say, design and technology lessons, the *Curriculum Auditing System* may be very valuable.

The *Monitoring and Reporting System* stores and analyses student data. It calculates grades and marks directly from pupils' results and prints out reports.

It runs on the Arc (as does the curriculum auditor) but isn't fully Risc OS. This is because it's designed for teachers who are not computer-literate and Ellis wanted to 'lead people through by the nose'.

The package creates a framework for assessment but has free text files so that teachers can input their own evaluations and comments. In other words, said Ellis, 'it gives users a structure but doesn't tie them down.'

Teachers have a choice of 75 statements at 10 levels so there are 750 things they can say about any one student. There is no limit to the number of registers that can be entered and up to 500 pupils can appear on any one register. Data can be imported from SIMS, SAMS and other management systems. It also supports input from optical mark readers.

Prices for the System are reasonable given its scope. The secondary version costs £299.95, for middle schools it's £199.95 and to primary or special schools it's £149.95.

For further details and a price for these two packages, Mick Ellis can be contacted at Cogent Software, 30 Norton Way North, Letchworth, Herts SG6 1BX.

POLICY COMMENT

Every school in the country should develop its own information technology policy, says a recent report from the British Computer Society.

The call is for the creation of a 'new post': a 'head of education IT' should be appointed in all schools to co-ordinate and implement IT policy. This would embrace staff development, software and hardware and management systems.

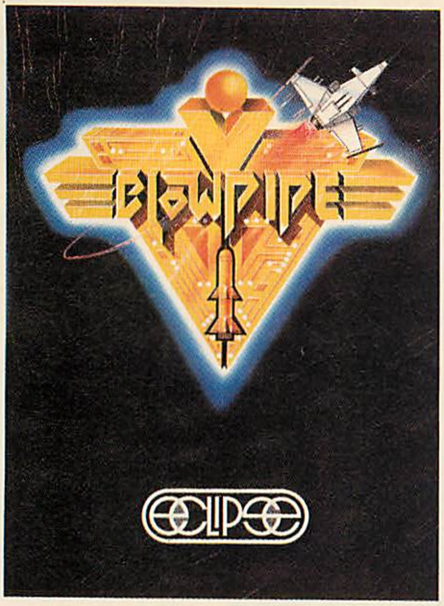
So does this mean that schools should unceremoniously bump off the worthy IT co-ordinators they've been nurturing for the last few years? And is it always appropriate for a curriculum specialist to be an administrative expert as well?

The British Computer Society's schools committee suggests that educational establishments consider moving towards a computer-to-pupil ratio of one to seven. Are present ratios due to lack of consideration on the part of schools, though?

A similar booklet for primary level is currently in preparation. Perhaps this will recommend that primary schools consider investing in the odd micro.

Information Technology within the National Curriculum: Secondary *is available from the BCS at 13 Mansfield Street, London W1M 0BP, for the sum of £1 per copy.*

Lisa Hughes



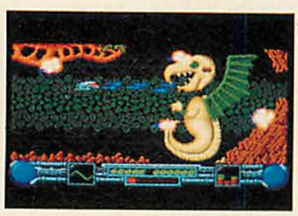
BLOWPIPE

Five levels of alien warfare lie before you – the most devilishly ingenious terra incognita you have ever faced awaits you, determined to question your genius and cause your downfall – can you keep ahead of this masterpiece of technical wizardry – conquer hitherto uncharted, undreamed of heights?

At the controls of the top specification ship, **The Annihilator**, you must establish a strategy to survive each level and collect as many credits as possible to use in the trading posts en route where you can equip your ship with even more powerful weaponry.

At the end of each stage, a fiendishly gruesome arch-guardian will try to check your progress through the portal to the next level – get it before it gets you and revel in your cunning.





Blowpipe is a masterpiece of Archimedes games' coding with over 2.5 megabytes of 256 colour graphics with up to 64 sprites on screen simultaneously. Over fifteen separate pieces of 4 channel stereo music with stunningly realistic sound effects heighten the excitement – explosive, mind-blowing, meteoric mega-action, all compressed onto just two discs.

WORLDSCAPE

Can you rectify world devastation? **Worldscape** affords you the opportunity to try, combining man's knowledge with your own ingenuity.

The fine balance of the planet Earth has been maintained by natural phenomena however catastrophic – volcanic eruption, earthquakes, tidal waves, plagues – but crucially, in the three hundred years since the Industrial Revolution, the human race has caused the global problems facing us today:

Atmospheric pollution caused by industrial gases

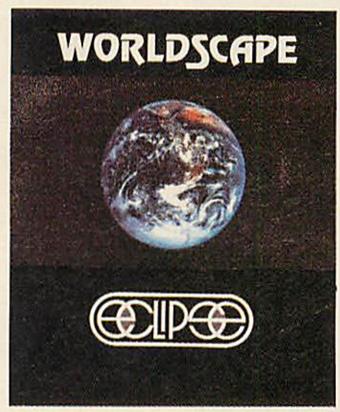
The hole in the ozone layer due to excessive use of CFC's

The "greenhouse" effect brought about by thoughtless and ill-considered deforestation.

Unless we act NOW, our legacy to future generations will be irreversible.

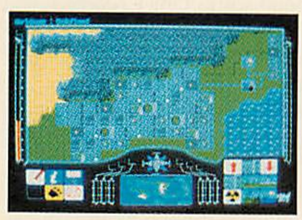
Can you improve on present-day thinking? **Worldscape** gives you the opportunity to try – use its built-in landscape generator to create totally unique landscapes – build cities, erect power stations, deal with sewage, plant your own forests – these and countless other options are available to you.

Remember you hold the advantage over scientists in the real world – you can correct your errors – mankind rarely can.



Complete on two discs with an accompanying comprehensive manual, **Worldscape** challenges you to change the world.

Your ultimate goal – world peace and harmony – perfection with ***Worldscape***





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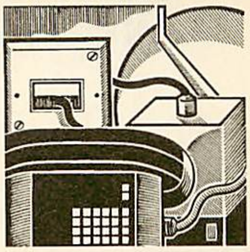
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CHATLINES SUSPENDED

A major attraction of using Prestel is the 'chatline' facility which is operated by Micronet. However, since June all chatlines have been suspended from the system owing to a few people abusing them.

Chatlines are public interactive 'pages' on the Prestel system, which can be compared to the CB radio system in many respects. Users can leave a short message on a chatline, and within a minute or so the message appears on the chatline page. Others can reply, and two-way conversations can ensue involving just a few, or many.

Micronet spent a lot of time and effort developing chatlines over the past few years. However, there have always been some people who have abused the facility. Previously, other users have reported such incidents, and the powers that be have given the culprits a warning or, if the abuse was serious or repeated, booted them off the system.

That's changed. British Telecom Managed Networked Serices has decided to pull the plug on chatlines – for the time being. The initial incident that



resulted in such drastic action is not known to me. But an on-line explanation from BTMNS states that it is currently reviewing ways of monitoring the chatlines in a more efficient and effective manner. Previously, chatlines were monitored on an *ad hoc* basis.

Until such time the chatlines are closed. I wonder why? My question arises because, with every chatline message, the sender's Systel (mailbox number) is also displayed. Surely it would be a simple matter to archive all messages, check through for offensive stuff, and then warn the culprit, or boot them off the system.

I get the impression that Prestel would like to find a method of checking through the messages prior to them being displayed.

Two problems there. First, it's been tried before on other systems and failed, and secondly, the delay incurred by checking the messages slows down the whole process.

For the time being, Prestel has taken away what is one of the most widely used features of its system. Let's all hope that a solution is found, and soon.

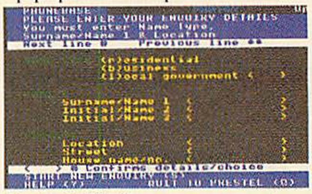


Believe it or not, but early next year you'll have the choice between British Telecom, Mercury and British Rail as your telecoms service! Don't laugh! BR has the largest private telephone network, and the majority is digital. Think about it, though. 'The next call arriving on platform 3...' And what about BR's alternative to the talking clock? It'll be late! Re-routing calls, and cancelling them altogether should be no problem, as BR has enough experience of that already.

DQ ON-LINE

No doubt many of you have heard the computer-generated voice of the directory enquiry computer, which speaks the digits of the number you are looking for. Now, those of you who subscribe to Prestel can use the very same computer via a gateway. Keying *PHONEBASE# will give you access to the system.

The main menu consists of a form which needs to be partly filled in. Quite often you can just tap in a surname and a location (even a general area), and up pops a list of possibilities.



Faults? Well, you can end up having to scan long lists of possibilities, which the directory enquiry operators would not allow you to do. It also fails to mention if 'not listed' means the individual does not have a phone, or is ex-directory.

David Janda

NEWS IN BRIEF

● Electronic Yellow Pages is a facility on Prestel which works on a similar basis to Phonebase. To access the system simply key in *EYP# when on-line.

In use the system is rather complicated. However, there is an on-line help facility, and the searches are very fast. Some entries will simply list the name, address and phone number, while others have additional information relating to what services are on offer.

● There's nothing better than a good read, I say. But when you are trying to find a particular title, it can be frustrating trying to find the damned title in the first place. No more so than in a book shop, where the choice is bound to be limited (compared to a library).

So it was good to hear from Sharbrook Systems, which has over 2000 computer-related titles. The company has set up an on-line catalogue which can be accessed on (0823) 333471.

The system allows callers to search by title, author or keyword, and is open 24 hours per day, seven days a week. Line speeds are 300, 1200 and 2400 baud.

● Remember my rant about the limited baud rate via the Arc serial port? Well, Lindsay Morrison of Kerridge Network Systems informs me that one of her chums has developed a custom serial port podule which can operate at 128,000 baud!

It can do this because the universal asynchronous receiver transmitter (UART) used in the podule is of the hardware type, rather than the slower software UART.

Please send any comms news to David Janda at* BBC Acorn User, *or electronically via Telecom Gold 81:RED001, Prestel 919992492, or Interspan BBC ACORN USER.

SIGN OF THE TIMES

Ever wanted to plaster your office with signs saying 'Genius at work' or 'Hackers keep out'?

Well, with the Master 512 or the Archimedes (with the PC emulator) you can create and print a wide range of signs to get your message across.

I've been looking at two packages which you might want to consider – *Sign-Master* and *Printmaster Plus*. Both have something to offer the budding signwriter – however, it is the cost, which varies from the moderate to the downright expensive, that may ultimately determine your choice.

Sign-Master from Ashton Tate is pricey, although it is a sophisticated, yet easy-to-use, graphics program which allows creative presentation of tables, headlines, summaries and outlines, which can be printed on a variety of plotters and printers.

There are six fonts to choose from – Standard, Bold, Roman, Bold Roman, Script and Swiss (a Helvetica clone). The sizes of individual characters, words or whole lines can be changed. Sizes range from 13 characters per inch to 1.5in per character. There is also a symbol font which provides 94 pictures.

The placement and orientation of signs is as easily managed as every other variable and what is most impressive is the ease with which you can control and understand the various options on offer. Following the five minute lesson does require occasional reference to the manual (which is comprehensive nevertheless) and, unless you have time on your hands, this is a real bonus.

Another of the company's products, a desktop publishing program called *Byline*, is an underrated masterpiece which, unfortunately, won't run on the Master. *Sign-Master* is good, but is priced for the business market – the home user would probably not want to spend over £100 producing a sign.



Printmaster Plus: versatile graphics program

But, for professional purposes, *Sign-Master* is worth looking at because of its versatility and user-friendliness. If signs are your business, check out the manual, since the many features justify the stiff price. If you use a plotter, then *Sign-Master* is well worth considering. With a printer only, ensure that your model is provided for. There is no point in creating a sign if no one can see it!

Printmaster Plus from Unison World is another versatile graphics program, allowing the design of personalised greetings cards, signs, stationery, calendars and banners. It is not as costly as *Sign-Master* and is more fun because it is not aimed at the corporate market.

Tapping in pm at the a> prompt brings up the main menu which invites you to choose the kind of publication you're after. First-time users would see the Hardware Configuration option screen which allows you to set up the printer. There are some 30 printers and the names are generic (Epson, Panasonic, Tandy, and so on), so this should present few problems.

Operating *Printmaster Plus* is simple – if you want to design a sign, for example, choosing the Poster option will invite you to choose a border. There are 11 types of border on the a: drive and another 20 on disc two on the b: drive. As you scroll through the lists each one is presented on the screen.

Once selected, the program moves on to the matter of text with a choice of 10 fonts on a: drive and another 26 on b: drive. You choose where to put the text and then decide on the choice of graphics. There are 100 illustrations to select from – whacky rather than professional ones (snowmen and elephants, not filing cabinets) – and there are three sizes for each. On a page you can choose from 15 different positions for the placement of your picture.

Again, the graphics are shown on the screen and there is a preview of the whole poster available. If something is not to your liking then you can backtrack, using the escape key, through as many of the stages as you like, stopping at any one to make changes.

The drawing pad option allows you to pick a graphic and edit it – for example, you could change the spots on the dice graphic. Graphics may be inverted, flipped, the pixels toggled or windows drawn in and filled with white or gray.

To summarise, *Printmaster Plus* is a terrific package and well worth playing with.

HINTS & HELP

When considering *Sign-Master* or *PrintMaster Plus*, shop around for prices – they can vary. With *PrintMaster Plus*, insist on the *Plus* version if you want the full range of fonts, borders and graphics.

Earlier versions will work on the Master 512, however, and they should be less expensive. It may also be worth enquiring about a single-disc package called *Sign Designer*, which is also Master 512 and Archimedes compatible. This will produce straightforward signs in one of three fonts, up to 123 characters per line, and from 0.25 to 8in in height. It should cost less than either of the above two main packages.

Whatever program you're using on the Master 512, a very neat and inexpensive idea comes from Essential Software.

A 512 memopad is a 'pop-up' notepad which, like its posh counterparts in *PC Tools* and *Sidekick*, can be accessed by hot-keys while working on another application. It provides about 10,000 bytes of storage (around four A4 pages) on one bank of sideways Ràm. Utilities are included for configuration to suit a variety of sideways Ram types and for allowing the contents to be saved to (Dos) disc files.

It costs £9.95 and is available from: PO Box 5, Groby, Leicestershire LE6 OZB.

LASER • DIRECT



The LaserDirect consists of an interface board, our RISC OS printer driver software, and a special version of the 300 dpi Qume six page per minute printer. Because the board drives the printer 'engine' directly, not only does this save a complex controller board usually resident in the printer, but it also means it prints very much faster than traditional printers. The speed is a combined result of our optimised RISC OS printer driver, the RISC processor and the unique 2Mbit/second data link to the printer. One other significant advantage is that the LaserDirect uses the Acorn outline fonts installed in the machine, so guaranteeing all fonts seen on screen will print - no need to make sure the fonts match those installed in your PostScript printer.

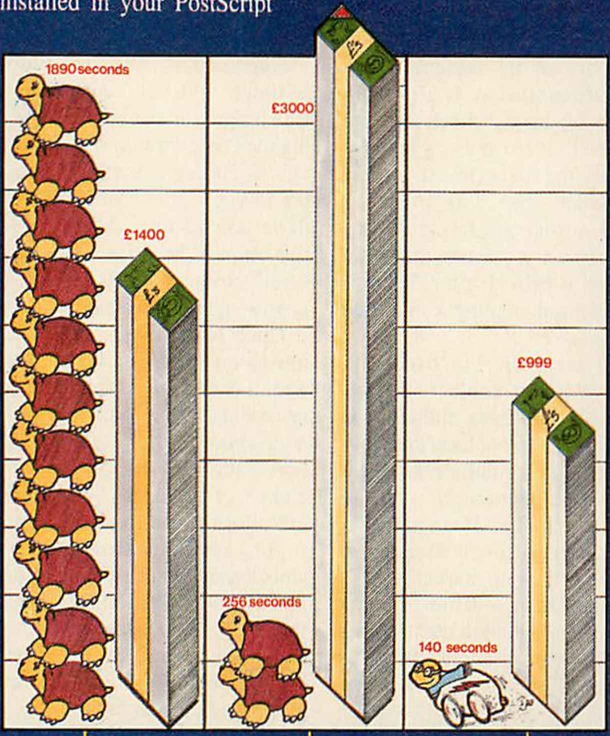
THE *FASTEST* ARCHIMEDES LASER PRINTER

Special features - Software on board means it is always available and can be automatically installed on startup - no loading from disc • The LaserDirect offers special links to other Computer Concepts software. For example, when combined with the new Scan-Light Plus software, it offers a direct scan to print facility. It can scan and print a full A4 page in under a minute. • A PostScript compatible interpreter will also be available, turning the Archimedes and LaserDirect printer into a very fast PostScript compatble printer (but using the Acorn outline fonts).

LaserDirect Qume (incl. printer, interface board, and software)
£999 +VAT & carriage

The result is a printer whose quality is the same or better than traditional lasers, that can use all RISC OS outline fonts, that is faster than traditional printers, and costs less.

The Qume Liquid Crystal Printer is not technically a laser printer. Instead of having a laser and spinning mirror arrangement, this printer has a conventional light source shining through a liquid crystal shutter array. The result is fewer moving parts, a lower cost and a more reliable printer. It also occupies a very small amount of desk space—42cm by 42cm, no more than a standard dot-matrix.



Compatible with all applications that use RISC OS printer drivers, e.g. Draw, Paint, Pipedream, ADP, Impression etc.

Graph shows time taken to print a typical 10 page document with a selection of different fonts, together with typical price.

Laser Direct— *the best price and best performance*

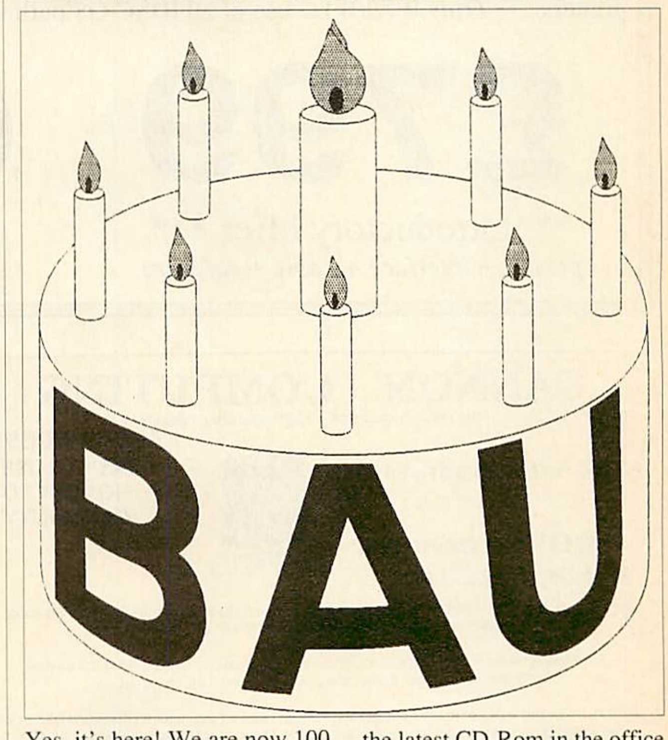
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HAPPY BIRTHDAY



Yes, it's here! We are now 100 issues old. Would you believe the first issue of *Acorn User* appeared in July 1982?

Well, we've all come a long way, and in the November issue we will celebrate with a look back over the last seven years – the people, the hardware and the software.

No celebration would be complete without a chance for you, the readers, to participate. So there's a mega competition for you to enter. Don't miss this chance to win one of our exciting birthday prizes.

CD-Rom technology is the thing of the future. We've had the latest CD-Rom in the office – so are we impressed? Read what our reviewer has to say.

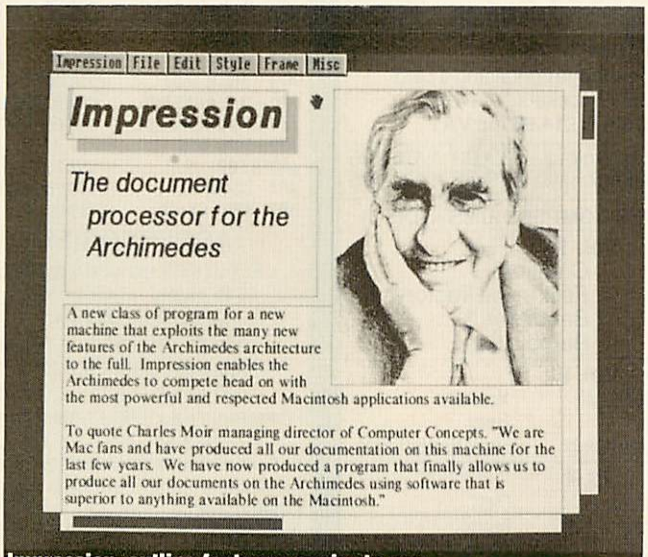
For Electron users there's the beginning of a series on building your own graphics package, with an emphasis on doing-it-yourself.

There's a program to render screen graphics directly onto your HPGL plotter, and our education special looks at English in the National Curriculum.

All this plus our regular games, reviews, hints and tips and news – not forgetting show news – go to make the November issue a very special birthday present to all our readers.

ORDER YOUR COPY NOW – IN THE SHOPS OCTOBER 11TH





Impression: outline fonts are easier to see

DO YOU DIG DONGLES?

Much has been written in recent months about the hardware key, or 'dongle', used by Computer Concepts to protect the *Impression* package.

I have not had any problems with it and at least it allows you to make working copies and backups.

The adverts for Beebug's *Ovation* package aim to attract purchasers by stating that the package is not hardware protected. What they do not tell you however is that it is software protected, which in my opinion is far worse.

The *Ovation* program disc is highly copy protected – none of the commercial disc copiers will work on it.

A utility disc allows you to make one working copy, again highly protected, either on a floppy or hard disc.

If you want to move your copy from one disc to another you have to run a special uninstall utility rendering the working copy unusable so that it may be copied.

What happens if one of the discs gets corrupted or you accidently move the *Ovation* application? Beebug certainly isn't going to give you another copy. I prefer a dongle any day!

Simon Burrows
Stughton
Leicestershire

LARGER CHARACTERS

I purchased an Acorn A3000 at the beginning of the year but before I was able to get to grips with it I virtually lost my sight due to illness.

At the present time I can just about see the keyboard but I cannot read the screen without a powerful magnifying glass.

Are you aware of any software or have you any suggestions that may be of use to me? I had to take early retirement because of ill health so I applied and have been accepted for an Open University course using audio tape.

It would obviously be of a great asset to me in coping with this if I could wordprocess by touch.

I use *Pipedream* and find it generally very user-friendly However, the cursor is almost invisible to me as it is a single thin red line.

Is there a way to alter this into a larger, more visible block, also is there any method of getting the magnifier from the second applications disc to multitask with *Pipedream* while in use?

Alan Totham
Chelmsford
Essex

The Archimedes has a very high resolution screen and thus the characters are usually very small. One way of making things more readable is to change to a lower resolution mode or to use Dave Acton's Newmodes utility (Risc Revue May 1990).

You should also adjust the screen colours for maximum contrast – say white on black.

Try using a wordprocessor such as *Impression* or *ADP* which uses outline fonts. These fonts can be made up to any size and the cursor, although it remains thin, does increase its height vertically.

Also from Clares is a wordprocessor especially designed to use large characters. It is called *Classmate* and will be available soon.

ASK SID

Having purchased your excellent magazine for the first time I am relieved to find so much help and support available. However I am confused over the Hotline article on page 27 of the August issue. How do I get into SID?

Jackie Birch
Brentwood
Essex

SID is Acorn's support information database and can be accessed through Prestel or Micronet.

However it is less expensive to access it directly, so contact Acorn for details.

Of course you will need Prestel communications software and a modem first.

DIPPY SOFTWARE

I have just purchased a Panasonic 16-24 printer and I am having some difficulty producing the desired effects.

Using the Epson printer driver from *View* I can't get it to produce Letter Quality output and no matter what I do all the text is printed out with large gaps between the lines.

G Armitage
Wetherby
Yorkshire

***View* prints a carriage return at the end of every line. Your printer also does this and thus two are printed giving double spaced text.**

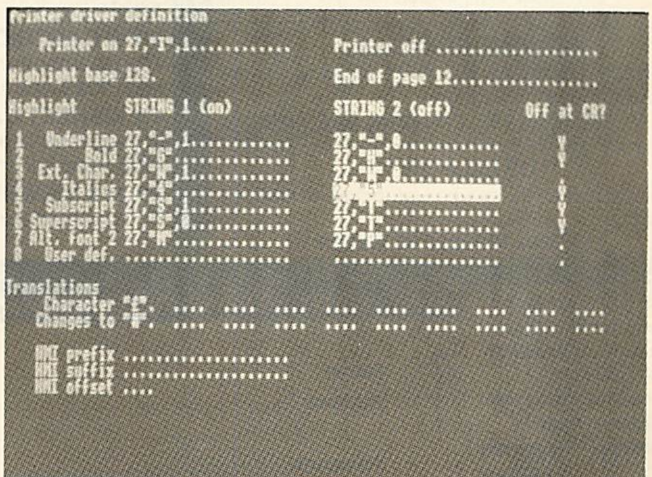
Most printers have DIP switches. Each of these switches controls a different function.

Using them you can set up the initial state of your printer, dictating things such as auto line feed, font names and letter quality.

However, increasingly, DIP switches are being replaced by internal software which consists of a series of yes/no questions accessed by selecting set-up mode from the printers front panel.

You will need to get into set-up mode and then select auto line feed to off, as you would if you were setting a DIP switch.

To print in letter quality you will have to choose an LQ font such as Courier.



Printer drivers: these days it's a panel game

PRES

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A low cost unit for those who just require a user port interface.
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Delta 3B Single Joystick	£13.00	£14.95
Delta 3B Twin Joystick	£19.09	£21.95

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Vol. III
Danger UXB, Adventure, Chess, Ghouls, Positron, Galactic Command, Felix and the Evil Weevils, Swoop

PRES — SUPERIOR SOFTWARE

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Arcadians, Magic Mushrooms, Bug Blaster, Meteros, Monsters, Video Revenge, Snooker, Qwak

Vol. V
Starship Command, Cosmic Camouflage, Maze, Guardian, Killer Gorilla 2, Planetoid, Frak, Constellation

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PROBLEMS A selection of problems from our Post A Problem service



QUESTIONS AND ANSWERS

Q I keep seeing references to a package called *Spark* for the Archimedes and BBC A3000. It seems to crop up in public domain packages and software downloaded from bulletin boards. What is it for?

A *Spark Plug* is the public domain extract-only version of *Spark*. The program is frequently found on Archimedes shareware or public domain disc. It is provided to enable users to decompress files.

However, *Spark* is a full archiving program for creating and maintaining file archives. It is entirely wimp-based, with the content of an archive displayed in a similar way to an ADFS directory.

Files can be pulled from a directory into the archive, or vice versa. *Spark* automatically compresses the file being archived and you can put 2Mb or more of sprites on to an 800K floppy disc.

Spark is available from: David Pilling, PO Box 22 Thorton Clevleys, Blackpool FY5 1LR. Price £5.99.

Q I have a BBC Master 128 and would like to write a program that uses a *Windows*–type environment, similar to that used by the Gem operating system which runs on an IBM PC or compatible.

Can you point me in the direction of any work done in this area?

A Completing such a task on an eight-bit BBC micro is not easy and a lot of program code is necessary.

I think the work done by Joe Telford is perhaps most useful. In *BAU* June 1987 he wrote about *Joe*, a program that provided an interface similar to *Gem*. It has most of the features you are trying to write into your own program and, by looking at the code, you should make progress with your own project.

You may also find it useful to look at Alan Blundell's article 'Window Shopping' (*BAU* July) where he shows how to use the Master's sideways Ram banks to good effect in creating a wimp environment.

Q When I was bargain hunting recently, I managed to pick up a Diablo daisywheel printer which I now want to connect up to my BBC micro.

Can you offer me any advice concerning the wiring up of the lead to connect the printer to the BBC micro.

A The normal connections between the BBC and a serial printer, which yours is, are as follows:

```
BBC RS432C port to serial
printer port
1 to 7
2 to 2
3 to 5
4 to 20
5 to 3
Pins 4, 6, and 9 are connected
together.
```

Ready-made cables are available from: MicroSnips, 37 Seaview Road, Wallasey, Merseyside L45 4QN.

You will need to set up the computer to use the serial printer by typing in:

*FX5,2 (this selects serial output)

*FX8,3 (this selects 300 baud)

Q I've heard somewhere that it is possible to get a copy of BBC Basic V, as supplied with an Archimedes, to run on the BBC micro. Is this so?

A Advanced Basic (published by Tube Link, PO Box 641, London, NW9 8TE) offers many of the facilities offered by BBC Basic V, at modest cost. However, you must have a 6502/65C102 second or Turbo processor to run the firmware.

Tube Link supplies the package in two versions, Sideways Ram or Eprom.

Q My BBC Master 128 system has two 80-track disc drives fitted. Is it possible to read 40-track discs on these drives? I've tried, but always get a disc error.

I heard there was a BBC command to help. Is there one and what is it?

A As the Master 128 has a 1770 disc interface the *DRIVE command can be used to specify 40- or 80-track drives. This means that 40-track discs can be read on 80-track drives without a hardware switch.

The format of the command is:

```
*DRIVE n t
```

where n is the drive number and t is 40 or 80.

Q I frequently have to turn my BBC micro on and off because a machine code program I am developing has gone wrong.

Is there anything I can do to completely reset the machine other than turning the

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then BBC Acorn User can help. The Post A Problem service guarentees to give you a personal answer within 10 working days for just £4.

Write out you problem with as much detail as possible and, if a program is involved, include a disc or cassette. Fill in the coupon at the bottom of this page and send it and your problem along with a cheque or postal order for £4 (including VAT) made out to Redwood Publishing. If you want recorded delivery add on the cost of this.

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computer on or off? I am concerned about the wear and tear on the power supply unit.

A If you can still type when the program you are developing goes wrong, try typing:

```
*FX151,78,127
```

and then press BREAK.

This will fool the computer into thinking it has been switched on and it will perform a cold reset.

Q I am developing an application for the A3000 and would like to know if it is possible to check which is the currently active filing system from within the program I am developing. Can it be done?

A Yes, this can be achieved with the SYS call

```
SYS "OS_Args" TO fsyst
```

After making the call the variable fsyst holds the number of the current filing system.

The three commonly encountered filing system numbers are:

```
ADFS 8
Econet 5
Ram 23
```

Q I am a keen user of *Impression* from Computer Concepts and feel frustrated that I cannot use the full potential of my NEC Pinwriter P6+ dot matrix printer with its colour option.

A Unfortunately, the standard 24-pin dot matrix Risc OS printer drivers supplied by Acorn do not allow the use of the colour option that you have added to your printer.

Very few companies provide support for owners of dot matrix colour ribbon printers. There is a Risc OS driver for the Integrex, but that is an ink jet printer and of little use.

Citizen has been working on a printer driver for its 24-pin colour dot matrix printer and this may be a possibility for you. I believe the printer escape codes are broadly compatible.

Another company you could turn to for support is Musbury Consultants (8 Fairhill, Helmshore, Rossendale, Lancs BB4 4JX). In the early days of the Arc the company was responsible for a number of colour printer dumps and these may have been uprated into printer drivers. You could also contact Clares, whose *Artisan* art packages are supported by colour printer drivers.

The only company that has made public the completion of Risc OS compatible printer drivers is Midnight Graphics (5 Victoria Lane, Whitefield, Manchester M25 6AL). The company supplies an LC10 Colour Printer Sprite Dump and ones for the Citizen Swift 9 and 24-pin printers.

Q My wife is on a word-processing course at the local college using *Locoscript* on an Amstrad PCW machine.

She now wants to work at home but, being a Beeb fan, I've always kept well away from Amstrads! I have a Master 125 with a 512 board fitted – is there a version of *Locoscript* for the IBM PC or would working with a Beeb wordprocessor help her?

A A number of students who have undertaken word-processing courses based on the Amstrad PCW and *Locoscript* use Acornsoft's *View* word-processing package at home.

Of course, it is entirely different in many operations, but the general principles are similar, especially the entering of text, formatting the text and loading, saving and printing.

Locomotive Software, which distributes *Locoscript*, has produced a version of the package especially for the IBM PC market. I have been unable to ascertain whether it will run on the 512 board, but this is quite likely. You may be able to get a PC dealer to let you check prior to final purchase.

If you are really looking for a suitable PC-type wordprocessor, rather than a BBC one, why not resort to Shareware. Dabs Press has two outstanding collections of packages that all run on the 512 board. Shareware 1 includes a powerful wordprocessor called *Mindreader* with a word anticipate function.

ACORN CUSTOMER HOTLINE

A number of people have asked how to change the default printer driver when loading *First Word Plus*. This can be achieved on both releases 1 and 2 by use of the following methods.

● Release 1 of *First Word Plus* – In the directory called $.resources.1wp on the program disc there is a file called 1wp_print which is the default printer driver that is loaded every time you start the package. This file should firstly be renamed to 1wp_print2 so that it can be retrieved if required at a later date. In the directory $.1wp.cfg of the utility disc you will find the variety of printer drivers that are supplied as standard with the package. The appropriate driver for your printer should be copied into the $.resources.1wp and can be renamed 1wp_print. This will then be loaded every time you load *First Word Plus*.

● Release 2 of *First Word Plus* – This is very similar to release 1 in that the original 1wp_print should be renamed and the appropriate driver should be copied from the utility disc to the program and and renamed to 1wp_print.

The directory structure of release 2 is however different to release 1 and the appropriate files can be found in the following directories:

The default printer driver can be found on the program disc in the directory $.!1stWord+ (this directory is entered by holding down SHIFT while double clicking on the directory).

The printer driver can be found on the utility disc in the directory $.1wp_print.config.

● You can now purchase upgrade software for use with the MIDI expansion card for the Archimedes, A3000 and the I/O Podule that has MIDI fitted. The upgrade provides extra functionality within the software. The new version is also required to run Pandora's *!Inspiration* software. The upgrades can be obtained from any Acorn dealer under the following stock codes.

AKA 54 - for A3000 User Port/ MIDI upgrade(AKA12) Rec. Retail Price £11.50.

AKA 55 - for Archimedes MIDI expansion card(AKA16) Rec. Retail Price £17.25.

AKA 56 - for Archimedes MIDI addon to I/O Podule(AKA15) Rec. Retail Price £13.80.

These prices do not include fitting.

● The amount of telesoftware on SID is continually increasing. We now have all the Archive Careware and Shareware discs available for downloading by registered users.

● Further to the information in the April issue on the Acorn Font Packs, Acorn has now released a revised and extended version of the Selwyn(Zapf Dingbats) font and includes the Sidney(Symbol) font. The Selwyn Font on this disc contains a full set of 202 symbols; it can replace the subset of 96 characters provided with *Acorn Desktop Publisher*. The Newhall Font pack contains three fonts in addition to those supplied with *ADP*, these are Newhall Medium, Newhall Bold Italic and Newhall Medium Italic. All the Font Packs include full information on how to update both the DTPconfig file for use with *ADP* and the PSprolog file for use with the Risc OS *!PrinterPS* application for driving Postscript printers.

● When copying files between directories under Risc OS it is necessary with the default copy options to delete any file that has the same filename as files that are copying into that directory. It is however possible to set the copy options so that a file will be overwritten when it is copied onto. The copy options should be set as follows:

```
*Set Copy$Options A ~C ~D F
~L N ~P Q R ~S ~T ~V
```

For more information on the copy options type:

```
*HELP COPY
```

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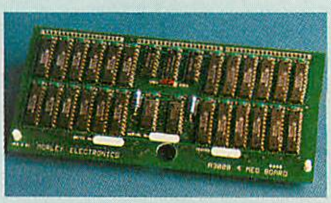
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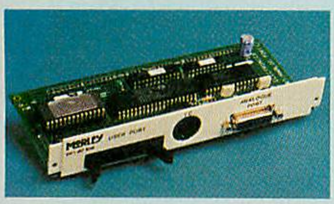
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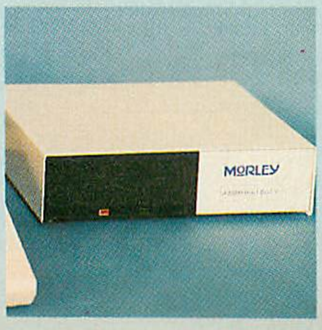
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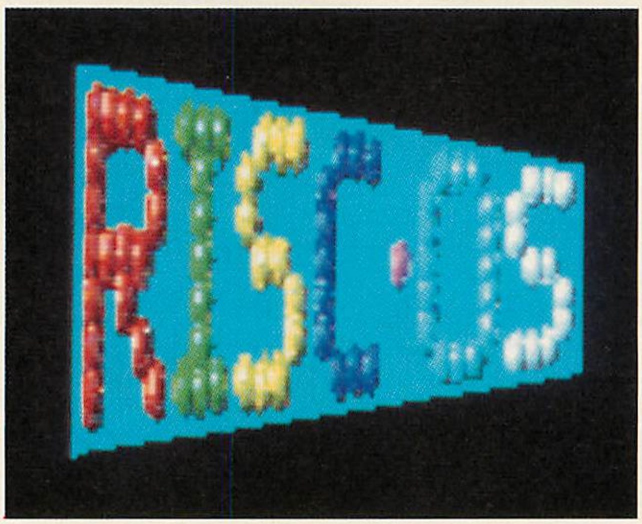
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RISC REVUE



MAP HAPPY

The speed of the good old Arm comes in very handy when squidging pictures about. Risc OS itself provides facilities for scaling sprites which have been dealt with in recent Risc Revues. But there are more possibilities, so here is a little demonstration in picture mapping. Just enter listing 1 on the yellow pages and run it.

The program assembles a fairly small piece of machine code which squeezes a given sprite onto a specified area of the screen. The area can be any 'stretched' rectangle, meaning that the sides are vertical but the top and bottom edges can be at any angle. The demonstration rotates a sprite through 3D space to illustrate what can be done.

If you have a copy of the PaintDemo file that comes on one of the applications discs, listing 1 will load this if you put it in the same directory. The effect is best using the Risc OS sprite. But, if the file isn't to hand, a simple text version is created to show the basic idea. Everything is done in mode 13 – a 256 colours (one byte per pixel) mode for simplicity and speed.

The program works by using two simple counters. The image is plotted onto the screen column by column. For each column, the top and bottom points of the displayed image are calculated and the distance between them found. This is compared with the height of the original column of the sprite. A counter is then set up to represent the scaling factor required to squeeze the column of bytes into the new space.

If, for example, the original column is 100 pixels high and the mapped version is only 25 pixels high on the screen, the counter will be four; every fourth byte will be used from the original column. An identical procedure is employed to get the horizontal scaling right. If the mapped version is bigger, the scaling counter will be less than one. If 0.5 for example, each original byte will appear twice on the screen.

A small piece of Basic is responsible for setting up or loading the sprites and calling the code with the appropriate parameters. These are passed in memory locations xpos0, xpos1 and so on. Two x co-ordinates are supplied for the left and right edges of the quadrilateral. These may cross over, in which case the sprite will appear backwards. Four y co-ordinates are given – the top and bottom points of the left edge (y0,y1) and the top and bottom points of the right edge (y2,y3).

Finally, an address is given in data that points to the actual sprite definition. This is found by reading the address of the sprite header using the call OS_SpriteOp with R0=24 and adding to this an offset found 32 bytes into the header.

The code begins by reading the screen start address and calculating two gradients. These are the slopes of the top and bottom edges. The variables stored at ya and yb are adjusted as the sprite is mapped, so they follow the top and bottom sides respectively.

There are two loops – the outer (at .columnloop) begins by calculating the screen address of the top byte of the current column and the vertical 'squashing factor' required. The inner loop (.plotloop) is designed to quickly transfer bytes to the screen. Every time a byte is transferred, the squashing factor (in temp2) is subtracted from the vertical stretch counter (in stretchv). Whenever this falls below zero the address of the next byte to be read is moved on by the appropriate number of rows.

Much of the work of the program is done by a fast division routine (at .divide). This takes the number in dividend, divides it by divisor and returns the integer result in result. Because it is an integer routine, many of the values in the program are shifted left by 16 bits (meaning multiplied by &10000) before division takes place in order to preserve some accuracy.

Even so, accuracy is not a major feature of the program – after all, the magnitudes of screen co-ordinates are small and the speed of the program needs to be high.

You can easily alter the listing to squash a sprite of your own. Remember that only 256-colour sprites will work accordingly, but you can change the mode number to 15 if you like, since the number of bytes on a screen row is read legally by the program.

You will also have to ensure that the sprite is a multiple of 32 pixels wide. This is because sprite definitions are padded on the left and right hand sides so their official widths do not necessarily represent the number of bytes each row of pixels takes up in memory. Any *SCREENSAVEd pictures should be fine.

£10 SOIXANTE-NEUF

What is the largest factorial that can be worked out on a standard scientific calculator? I bet that many of you would know the answer to be 69 (at our school, the 69 factorial test was a standard measure of a calculator's speed.)

Well, here's a program from **A Reysenbach** of Amsterdam which not only calculates factorials up to 10,000, but will also display them accurately. The listing is number 2 on the yellow pages.

The program works in a similar way to one of Mr R's previous submissions which calculated large powers. An array is created with one element for each of the digits in the answer. A simple add-with-carry approach is employed to do the calculation. The program takes a little while to work out the larger factorials so, if you have either Risc Basic or ABC, you might like to try compiling the program to speed matters up.

SILLY SORT

I have mentioned the call OS_HeapSort in this column several times before, as this built-in sorting routine is one of my favourite SWIs. I it might be interesting to see what goes on when the call is invoked, so listing 3 attempts to do this.

A mode 15 screen (ensure you have 160K of screen memory available) is filled with randomly coloured blocks. OS_HeapSort likes to work on integers – so, for the best effect, the screen is filled with word-sized blocks of the same colour. Then the screen is sorted!

First, this call is used:

```
SYS "OS_HeapSort",
&A000, b%,code%,0
```

The first parameter is the number of integers to sort, the second is the screen start address and the last is 0 meaning 'unsigned integers'. The effect is impressive, order appearing at the bottom and sweeping upwards as the unsorted words scatter about.

When sorted, OS_HeapSort is called again, this time with a final parameter of code%. This is the address of the comparison routine. Every time two elements need to be compared, code% is called with R0 and R1 containing the elements. The single instruction CMP R1,R0 is enough for the words to be sorted in descending order. The screen will continue to be sorted alternately in the two ways until ESCAPE is pressed.

£15 3D GRAPHS

An old favourite, but new to this column is a routine for plotting 3D graphs from **James Gallagher** of Kingsbury in London.

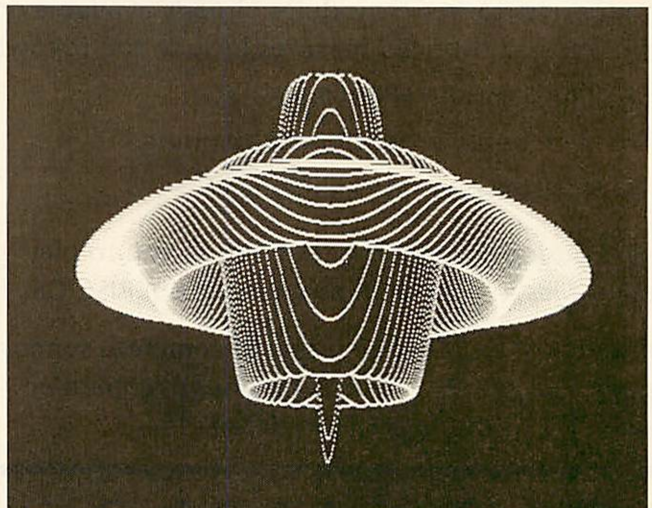
Listing 4, in its published form, plots the graph of y=EXP(-r*r)*COS(3*PI*r) where r=SQR (x*x+z*z). Altering the value of s% to something smaller (such as 20) will speed up the plotting but the number of contours will be lower, so the quality of the final graph will be inferior.

The variables a and b are the z and y co-ordinates of the viewing point, so alternative views may be experienced by altering their values. James suggests a value of -1.5 for b, which produces a view from underneath. Changing disc% to FALSE causes the plot to be of the whole visible x-z plane rather than just a disc. This takes a little longer but the effect is good.

Other functions may be plotted easily by making alterations to the listing. Line 250 is where the y co-ordinate is evaluated, so alter this and the values of s%, disc%, a and b as appropriate. Some examples given by James include:

```
y(i%)=EXP(-r*r) with s%=40
disc%=TRUE  y(i%)=0.2*COS
(3*PI*r) with s%=80
disc%=FALSE y(i%)=0.5*SIN(2*x)*COS(z)
with s%=80,disc%=TRUE,
rad=PI
```

Only symmetrical functions can be plotted with the listing in its present form. Points are plotted in pairs to save time. Simply alter the FOR...NEXT loop at line 170 to go from -rad to rad and delete the second POINT command of line 370 if you want to plot asymmetrical functions.



3-D Graphics: does it cause crop circles?

SMALL CHANGE

Because many desktop applications use sprites for display (which means they draw and write on the sprite and then plot the sprite in one go on the screen) a call is provided in Risc OS to indicate which areas of a sprite or the screen have changed.

So, if a few pixels in the top left hand corner have moved, only the area affected need be replotted and the rest can be ignored. The wonderful call that does this work for us is OS_ChangedBox and an example is given as listing 5 on the yellow pages.

Run the program – a circle of changing colour will bounce around the screen. In fact, this circle is being plotted on a sprite which is then plotted on the screen. Pressing the space bar toggles the ChangedBox option. When ON, only the part of the sprite that is known to have changed is replotted and the speed improvement is obvious. Mode 15 is used to highlight this - ensure you have enough screen memory (160K or more).

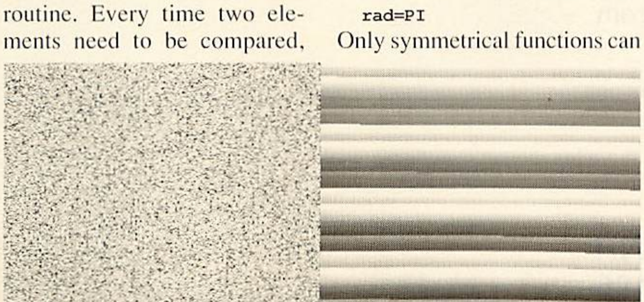
The plotting is done by first switching VDU output to our own sprite. This is done with SYS "OS_SpriteOp",61 after previously setting aside a block of memory (at pres%) so VDU information can be preserved for when output is returned to the screen. The size of pres% is read with "OS_SpriteOp",62.

Before plotting begins, SYS "OS_ChangedBox" is called with R0=2 to reset the facility and then with R0=1 to begin keeping track. After plotting has finished, it is again called – this time with R0=-1.

The address of a 16-byte data block is returned and this is the window that has been changed. A graphics window is set up and then the sprite is plotted. Note that the block of data (at info%) is somewhere in the OS's workspace and therefore we have to make a note of its contents immediately.

WHERE'S YOURS THEN?

Please send programs, ideas, hints and tips to: Risc Revue, *Acorn User*, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ. The produce of your talented fingers is the bread and butter of this column, and could help countless fellow enthusiasts to get more out of their Arcs. So why not drop us a line today?



Silly Sort: Random pixels (left) are put into order in a jiffy

Send for fact sheets on technoSCAN, technoTablet, Multipod & Hard Disk Upgrades

TECHNOMATIC

Techno House 468 Church Lane, London NW9 8UF.
Tel: 081-205 9558 Fax: 081-205 0190
Mon-Fri: 9.15-5.30. Sat: 10.30-4.00

All prices ex VAT.
Prices are subject to change without notice.

Please add carriage
(a) £8.00 (Courier, 2 days)
(b) £3.50 (c) £2.00 (d) £1.50
Next day delivery at extra charge

Archimedes COMPUTERS

A3000 (no monitor)	£599
A3000 Acorn Colour	£799
A3000 Cub 3000 monitor	£789
Learning Curve	
LC (no monitor)	£699
LC Cub 3000 monitor	£873
A410/1 (no monitor)	£1099
A410/1 Acorn Colour	£1299
A410/1 Taxan 775*	£1459
Acorn 420/1 systems	
420/1 (no monitor)	£1499
420/1 Acorn Colour	£1699
Acorn 440/1 systems	
440/1 Acorn Colour	£2299
440/1 Taxan 775	£2349

Carriage £8/computer £12/system

SPECIAL FINANCIAL DEALS OR 10% VOUCHERS TO GET YOU STARTED

We can offer you either special finance or a 10% discount voucher on all of the above Archimedes systems. Finance will be over 12 monthly installments and an initial deposit. We will pay all interest charges. Please write or phone for full details and a personal quotation. Subject to status we should be able to despatch your order within 7 days of receipt. Vouchers will be to the value of 10% of the purchase price when purchased at the prices shown above and will be valid for 90 days from the date of issue. Special finance or vouchers are not available on Techno bundled packages.

technoSCAN

A versatile hand held scanner for Archimedes offering four monochrome resolutions (100, 200, 300 & 400 dpi) as well as having 4 different modes of operation to select grey scaled or monochrome images.
Software is fully integrated with the multi-tasking RISC OS and utilises the desktop environment to facilitate easy incorporation of scanned images into RISC OS compatible DTP, WP, art or drawing package.
The scanning area is 4" wide and vertical height is limited only by memory constraints. The image brightness is adjustable to obtain the optimum quality. Tone selector allows different settings for text and photos.
Software appears as an icon on the icon bar from where all its facilities can be accessed. Software features include:
Visual rescaling of either X or Y axis, X & Y flips, colour tinting, picture cropping, on screen help, etc. RISC OS's anti aliaising feature is utilised to enhance the image quality.
Scanned images can be saved as sprite file or dragged into other applications. The images can be output to compatible printer as a sprite using one of the RISC OS versatile printer drivers.
The manual is written in easy to follow style with hints and tips for getting the best results. The manual together with interactive on-screen help gets you going almost immediately you have installed the scanner.

***techno*SCAN complete with interface card and manual**	£149(b)
***techno*SCAN for A3000**	£175(b)

What we offer in addition to efficient sales service and professional backup!

We not only offer professional advice when you are purchasing your system but we will also provide friendly assistance afterwards. All our products carry a 12 month full warranty for parts and labour.

TECHNO 410/1 SYSTEMS UPGRADED TO 420/1 SPEC.

With CUB 3000 colour monitor	£1249
With Taxan 775 multisync	£1429

Carriage £12.
Finance available on chargeable basis.
Ring for the latest prices on Archimedes 440/1 Systems.

TECHNO 410/1 SPECIAL

Offer extended due to popular demand.

Archimedes 410/1 upgraded to full 440/1 specification with 4 MB RAM and 50 MB Hard Disc (Acorn) plus Taxan 775 Multisync Monitor and including Pipedream 3 and Atelier as well as RISC OS Extras & SID Utilities discs, a packet of discs, a printer lead and a mouse mat.

for only £1819 carr £12
Finance available on chargeable basis.

TECHNO 410/40 UPGRADES

A410/1 upgraded to 4 MB RAM and 40 MB Hard Drive complete with Mouse Mat, 1 box of 3.5" discs, printer lead and First Word Plus Release 2.
Now with the Atelier art package & RISC OS Extras & SID Utilities discs
Our 40 MB Hard Drive is a high spec, AutoPark, 25ms, quality drive with a reliable mechanism.

techno 410/40 with Cub 3000 Colour Monitor	£1549
techno 410/40 with Taxan 775 Colour Monitor	£1759

Finance available on chargeable basis.

technoTablet

Our 12" by 12" working area technoTablet offers a resolution of 1000 lines/in and connects through the serial port of the computer. The tablet can take over virtually all the functions of a mouse simplifying the use of graphics packages.
A four button puck moves over the special surface, its cross-wires allowing simple and accurate transfer of drawings. The optional stylus will make tracings, line drawings etc much easier and more accurate.
The driver software is genuine RISCware and provides commands to turn the tablet on or off, select relative or absolute coordinates, change puck movement sensitivity and scaling.
The package includes the tablet, puck, software and mains power supply, no connections are required to the ARC main board.

technoTablet	£249(a)
Optional Stylus	£25(d)
PC mouse drivers and art package	£12(c)

NEW A410/1 technoTURBO

The latest in our popular range of Archimedes bundles is the fastest Arc yet.
A410/1 with a 40 Mb autoparking hard drive and TAXAN 775 Multisync monitor.

Fitted with 30 MHz ARM 3 and a magnificent total of 8 Mb RAM

A410/1 technoTURBO
£2999
carr. £12

TECHNO DTP PACKAGE

Archimedes 410/1 upgraded to full 420/1 spec with 2 Mb RAM and 20 Mb Drive, Cub 3000 colour monitor. Featuring our technoSCAN package and RISC OS Extras & SID Utilities discs with the Atelier art package and either

Acorn DTP Package First Word Plus Rel 2, Logistix

or

Impression and Pipedream 3

and a free mouse mat for only £1639 carr £12
Finance available on chargeable basis.
Special Educational Subsidy on the Techno DTP package.

A3000 LEARNING CURVE PACKAGE

with 1MB ACORN A3000
Tutorial Video
GENESIS Database
PC Emulator
FIRST WORD PLUS Wordprocessor
the parents guide to the national curriculum
A3000 LEARNING CURVE
£699
Suitable monitor available separately

TEL: 081-205 9558

Archimedes Applications Software for Business & Leisure. Ring for lists

TECHNOMATIC

Techno House 468 Church Lane, London NW9 8UF.
Tel: 081-205 9558 Fax: 081-205 0190
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(a) £8.00 (Courier)
(b) £3.50
(c) £2.00
(d) £1.50

Archimedes EXPANSION OPTIONS

NEW LOW PRICES ON RAM UPGRADES

400/1 RAM UPGRADES

1Mb RAM upgrade (410/1)	**£79(c)**
2Mb RAM upgrade (420/1)	**£158(b)**
3Mb RAM upgrade (410/1)	**£235(b)**

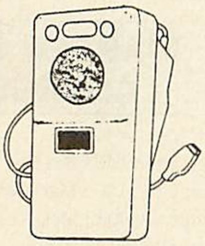
400/1 RAM and Drive Packs

1Mb + 20Mb HD	**£239(a)**
1Mb + 40Mb HD (Toshiba)	**£355(a)**
3Mb + 20Mb HD	**£389(a)**
3Mb + 40Mb HD (Toshiba)	**£479(a)**
3Mb + 50Mb HD	**£529(a)**

All the above upgrade packs come complete with cables, brackets and fitting instructions. Hard drives are ready formatted.

TRACKER BALL

A sturdy, high quality tracker ball is now available to replace the Archimedes mouse. You will no longer run off your mouse mat and at the same time you can save the valuable desk space. The tracker ball is fully compatible with the Arc mouse driver. **£47(c)**



HARD DRIVES & CONTROLLERS

Acorn 20Mb HD + Controller (310)	**£379(a)**
A3000 HD Controller and 20Mb drive	**£389(a)**
A3000 HD Controller and 40Mb drive	**£509(a)**

Both units separately cased with external PSU for the drive.

Techno HD Controller for 2 HD (310)*	**£149(b)**
SCSI HD Controller	**£299(a)**

Internal ST506 drives for 410 supplied complete with mounting bracket, cables & instructions

Techno 20Mb 40 ms	**£179(a)**
40Mb 25 ms Autoparking	**£329(a)**

Auto parking for ease of use.

Techno 50Mb 28 ms	**£369(a)**

External ST506 HD as 2nd HD

20Mb (cased & psu, cables)	**£249(a)**
40Mb (cased & psu, cables)	**£379(a)**
50Mb (cased & psu, cables)	**£449(a)**
External HD adaptor plate (300/400)	**£30(c)**

A3000 4MB RAM CAPABILITY

The TechnoRAM Card for the A3000 with either 1MB or 3MB on board, allows you to expand up to 2 or 4MB. 1MB version upgradeable by us to 3MB. Totally compatible with Econet upgrades.

1MB technoRAM £79(c) **3MB technoRAM £179(c)**

ARCHIMEDES MONITORS

Microvitec CUB 3000 14″ RGB
Med Res, specially designed for ARC **£199(a)**
Dust Cover for CUB 3000 **£5.50(d)**

Philips CM8833 14″ RGB Med Res.
TTL/Linear Mono/Colour, Stereo sound. **£239(a)**

Acorn Philips 14″
Colour Monitor **£220(a)**

TAXAN 775
MultiSysnc 14″ colour, ideal for Archimedes hi res modes. Our price includes tilt and swivel stand. **£429(a)**

VIKING II 19″ Hi Res.
White screen for CAD applications with tilt & swivel stand. **£849(a)**

A3000 EXPANSION

AEDA external floppy drive adaptor	**£30(c)**
Wild Vision Chroma 220	**£155(b)**
Wild Vision Chroma 235	**£199(b)**
Wild Vision Chroma 250	**£355(b)**
Acorn MIDI/User port	**£49(b)**
Chromatext	**£39(c)**
XAT Video Utilities Package	**£79(c)**
MultiPod	**£145(b)**
technoSCAN	**£175(a)**
Tracker Ball	**£47(c)**
technoTABLET (needs serial kit)	**£249(a)**
Stylus	**£25(d)**
Serial upgrade kit	**£19(c)**

300/400 SERIES EXPANSION

Technolog backplane (4 slots)	**£23(c)**
Fan for Technolog backplane	**£8(d)**
I/O expansion card	**£80(b)**
MIDI add-on to I/O card	**£37(c)**
MIDI Expansion card	**£66(c)**
CC Rom expansion card	**£45(c)**
ACORN ROM expansion card	**£51(c)**
MultiPod	**£117(b)**
16 bit Parallel I/O card	**£195(b)**
ADC1208 A to D converter	**£695(b)**
Dual RS232 Serial card	**£195(b)**
IEEE Interface card	**£283(b)**
Tracker Ball	**£47(c)**
technoTABLET	**£249(a)**
Stylus	**£25(d)**
ARC Prototyping board	**£35(c)**
Wild Vision Chroma 320	**£155(b)**
Wild Vision Chroma 335	**£295(b)**
Wild Vision Chroma 345	**£395(b)**
Wild Vision Chroma 400	**P.O.A.**
Chromatext	**£39(c)**
XAT Video Utilities Package	**£79(c)**

technoSCSI PACKAGES

High quality SCSI drives with ACORN's SCSI controller card.

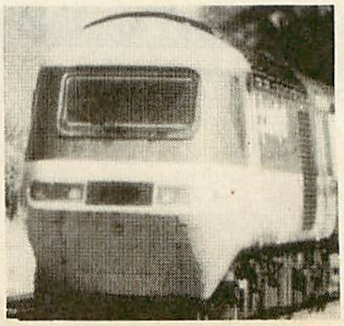
105 Mb Internal	**£899(a)**
330 Mb External	**£1999(a)**
105Mb External	**£999(a)**

Phone for free data sheet

External drives are suitable for 300, 400 series and A3000

MULTIPOD PROFESSIONAL

Professional design and use of latest hardware/software technology have enabled this five function podule to provide the highest quality performance at economical and realistic price. The five functions are fast-scan video digitiser, sound digitiser, serial port, instrumentation/joystick port and 3 BBC compatible ROM sockets.



MULTIPOD PROFESSIONAL	**£117(b)**
MULTIPOD PROFESSIONAL FOR THE A3000	**£145(b)**
FILTER SET FOR VIDEO CAMERA (RGB)	**£15(d)**

TEL: 081-205 9558

Dabhand Computing Ltd.

TERMS: UK residents add 15% VAT to all prices, except books. Delivery FREE on all postal items in the UK. Export, no VAT, carriage at cost. (quotations available). Europe maximum £2.50 software, £35 hardware. Access/Visa cards accepted by post/phone/in person. We are authorised Acorn dealers. Official orders accepted from public sector/education/PLCs, otherwise cash with order. Tender invitations welcome. Callers welcome. We are about 800 yds north of J17, M62. Fax: 061-766 8425. Price subject to change without notification. Goods offered subject to being unsold.

Dabhand Computing Ltd, 5 Victoria Lane, Whitefield, Manchester M25 6AL. This advert was produced using Impression from Computer Concepts.

Archimedes Computers

A 3000	**£599**
A 3000 Learning Curve *	**£699**
A 410/1	**£1099**
A 420/1	**£1499**
A 440/1	**£1699**

We can match or improve on prices advertised or quoted in or from this magazine please phone for the best deals.

We operate the Acorn Schools, University and the New teachers personal purchase schemes.

* Pack includes PC Emulator, 1st Word Plus, Genesis and Learning Curve Video.

Oak SCSI Devices

20 Mb Internal Hard Disc	£345
45 Mb Internal Hard Disc	£449
80 Mb Internal Hard Disc	£592
100 Mb Internal Hard Disc	£783
200 Mb Internal Hard Disc	£1125
20 Mb External Hard Disc	£485
45 Mb External Hard Disc	£565
80 Mb External Hard Disc	£727
100 Mb External Hard Disc	£919
200 Mb External Hard Disc	£1235
300 Mb External Hard Disc	£2010
512 Mb External Hard Disc	£2535
560 Mb Magneto Optical Drive	£3220
42 Mb Ext. Removable Hard Disc	£999
60 Mb Tape Streamer	£860
Tape for above	£22
150 Mb Tape Streamer	£1249
Tape for above	£25
1 Gb Tape Drive	£2535
Tape for above	£30
for additional devices deduct	£60

Archimedes A400

5.25" Ext. floppy disc interface	£30
Additional 3.5" Floppy Disc	£119
ARM 3 Upgrade (30 MHZ)	£545
ARM 3 Upgrade (20 MHZ)	£445
ArVis S-VHS Video Cont. Board	£295
ArVis S-VHS Encoder Board	£145
ArVis Video Graphics Board	£877
Chroma 345 Overlay Board	£389
Econet Module	£46
Ethernet Expansion Card	£449
Floating Point Expansion Card	£549
Hawk V9 Video Digitiser	£339
I/O Expansion Card	£79
Midi Upgrade to I/O Exp. Card	£27
Midi Expansion Card	£65
Midi Upgrade Rom	£14
Rom Expansion Card (CC)	£45
Rom Exp. Card with Battery (CC)	£65
Scanlight Junior Scanner (CC)	£179
Scanlight Senior Scanner (CC)	£389
Sheet Feeder for above (CC)	£95
SCSI Expansion Card (Acorn)	£299
VIDC Enhancer	£29

Dabhand 400 Series Expansion Options

Dabhand 410/1 to 420/1

Acorn A410/1 upgraded to A420/1 specification using only the highest quality Samsung Ram and Oak's "Zero Defect" 20 Mb Seagate ST 125-1 28ms drive formatted and tested for guaranteed trouble free use.

A410/2 20 Mb	**£1099**
Colour System	**£1289**
Eizo 9060 SZ System	**£1558**

Dabhand 410/1 to 440/1

Acorn A410/1 upgraded to A440/1 specification using Oak's 47 Mb Rodime 24ms drive formatted and tested as above.

A440/1 specification	**£1349**
Colour System	**£1538**
Eizo 9060 SZ System	**£1808**

Oak 410/1 ST506 Hard Disc Drives

Archimedes A410 Internal Hard Disc Drives for use with 'on-board' ST506 winchester controller. Comes complete with mounting chassis, screws, connecting cables and easy to follow fitting instructions.

20 Mb 28ms	**£169**
40 Mb 28ms	**£285**
47 Mb 24ms	**£345**

A400 Series Ram Upgrades

Fast Samsung Ram complete with step by step fitting instructions.

1 Mb Ram	**£50**
2 Mb Ram	**£95**
3 Mb Ram	**£140**

A410/1 Series Ram and Oak Drive Upgrades

Up to 2 Mb Ram + 20 Mb	**£229**
Up to 2 Mb Ram + 40 Mb	**£349**
Up to 2 Mb Ram + 47 Mb	**£409**
Up to 4 Mb Ram + 20 Mb	**£339**
Up to 4 Mb Ram + 40 Mb	**£459**
Up to 4 Mb Ram + 47 Mb	**£519**

Dabhand Art/CDT Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Pro Artisan
WorraCAD
RISC OS Extras & Utils Discs
Box of discs, printer cable and mouse mat

A410/2 Art/CDT Pack	**£1219**
Colour System	**£1408**
Eizo 9060 SZ System	**£1678**

Dabhand DTP Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Impression & Scanlight Junior
Pro Artisan
RISC OS Extras & Utils Discs
Font FX, Box of discs, printer cable and mouse mat

A410/2 DTP Pack	**£1439**
Colour System	**£1628**
Eizo 9060 SZ System	**£1898**

Dabhand Business Pack

Acorn A410/1 upgraded to A420/1 specification complete with:-

Impression & Scanlight Junior
Pipedream
RISC OS Extras & Utils Discs
Font FX, Box of discs, printer cable and mouse mat

A410/2 DTP Pack	**£1469**
Colour System	**£1658**
Eizo 9060 SZ System	**£1928**

Additional upgrades for Dabhand Packs

Up to 4 Mb Ram	**£95**
Up to 40 Mb Hard Disc	**£116**
Up to 47 Mb Hard Disc	**£176**
Up to 4 Mb Ram + 40 Mb	**£236**
Up to 4 Mb Ram + 47 Mb	**£296**

Please add these prices to the base system prices quoted above.

Floppy Disc Drives

5.25" Single 40/80 no psu	£95
5.25" Single 40/80 with psu	£109
5.25" Dual 40/80 no psu	£185
5.25" Dual 40/80 with psu	£199
3.5" Single with psu	£85
3.5" + 5.25" 40/80 no psu	£185
3.5" + 5.25" 40/80 with psu	£209

Monitors

Acorn badged Colour	**£199**
EIZO 9060SZ Multisync	**£465**
EIZO 9070SZ Multisync	**£649**
Philips CM8833	**£225**

All monitors come with free lead. State type of computer when ordering.

Dabhand A3000 Series Expansion Options

A3000 Art/CDT Pack

Acorn A3000 upgraded to 2 Mb of memory complete with:-

Pro Artisan
WorraCAD
Oak monitor stand and expansion bridge
Acorn Colour Monitor
RISC OS Extras & Utils Discs
Box of discs, printer cable and mouse mat

A3000/2 Art/CDT Pack £999

A3000 DTP Pack

Acorn A3000 upgraded to 2 Mb of memory complete with:-

Pro Artisan
Impression & Scanlight Junior
Oak monitor stand and expansion bridge
Acorn Colour Monitor
RISC OS Extras & Utils Discs
Box of discs, printer cable, Font FX and mouse mat

A3000/2 DTP Pack £1299

Oak A3000 Expansion System

Monitor Stand	£21
System Housing	£35
18 Watt PSU (Floppy Disc Drives)	£30
55 Watt PSU (Hard Disc Drive)	£79
90 Watt PSU (Hard Disc & Tape)	£89
Fan Kit	£15
3.5" Floppy Kit	£94
5.25" Floppy Kit	£84
20 Mb SCSI + Controller	£385
45 Mb SCSI + Controller	£505
80 Mb SCSI + Controller	£753
100 Mb SCSI + Controller	£944
200 Mb SCSI + Controller	£1260

Ring for details of full range including Tape Drives, Removable Hard Discs.

A3000 SCSI Devices

20 Mb External Hard Disc	£485
45 Mb External Hard Disc	£565
80 Mb External Hard Disc	£727
100 Mb External Hard Disc	£919
200 Mb External Hard Disc	£1235
300 Mb External Hard Disc	£2010
512 Mb External Hard Disc	£2535
560 Mb Magneto Optical Drive	£3220
42 Mb Ext. Removable Hard Disc	£999
60 Mb Tape Streamer	£860
Tape for above	£22
150 Mb Tape Streamer	£1249
Tape for above	£25
1 Gb Tape Drive	£2535
Tape for above	£30

A3000 Upgrades

User & Midi Podule	£46
Serial Upgrade	£19
Monitor Stand (Acorn)	£29
Monitor Stand (Pres)	£24
5.25" External floppy disc cable	£15
5.25" External floppy disc buffer (Pres)	£46
Serial Link Kit (BBC-Arc)	£14
Dust cover (Keyboard + Monitor)	£12

Printers

Citizen 120D+ (Serial add £20)	£129
Citizen Swift 9	£195
Star LC10	£139
Star LC10 Colour	£179
Canon Bubblejet BJ-130E	£539
Citizen Swift 24	£259
Colour Kit for above (also Swift 9)	£39
Sheet Feeder for Swift Range	£89
Star LC24-10	£209
Integrex Colourjet 132	£519
HP Paintjet	£795
LASER DIRECT (CC)	£899
HP Laserjet IIP Printer	£795
Additional 1Mb RAM for IIP	£179

Master Series

Master 128	**£369**
Master Colour Monitor	£189
Eprom Cartridge	£10
Master Dust Covers	£6

Books (No Vat)

C: A Dabhand Guide	£14.95
Archimedes Assembly Language	£14.95
Archimedes Operating System	£14.95
The above books have accompanying discs add £5 for 5.25", £7 for 3.5"	
Archimedes First Steps	£9.95
BASIC V: A Dabhand Guide	£9.95
RISCOS PRM's	£79.95
NEW Acorn DTP Advanced U.G.	£14.95
BBC Basic Guide (Acorn)	£19.95
Master 128 Ref. Man.Pts 1&2 .. (ea.)	£14.95
New Advanced User Guide	£19.95
Additional Arc Software Manuals (Acornsoft)	
First Word Plus, DTP, Assembler . (ea.)	£10
ANSI C Version 3	£19

A3000 Ram Upgrade

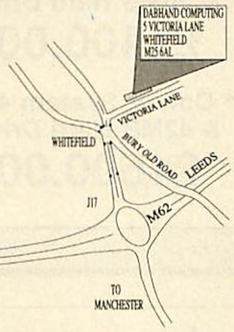
1 Mb upgrade using high quality Ram

1 Mb Ram Upgrade £79

Software

Acorn Desktop Publisher	£109.95
Alien Invasion (Dabs Press)	£11.95
ANSI C V.3 Compiler + free C Guide	£139.95
Apocolypse (3D Space Game)	£24.95
Arc DFS (DFS Filing System)	£24.95
Arcade Soccer	£14.95
ArcComm (BBC Soft)	£24.95
ArcTerm (Serial Port)	£59.00
Armadeus & Sampler Board (Sound Sampler)	£199.00
Artisan 2 (16 Colours)	£49.95
Atelier (Minerva 256 Colours)	£79.95
Battle Tank (Minerva)	£12.95
Clip Art for Draw/Impress. (Midnight Graphics)	£29.95
Colour Printer Sprite Dumps (Midnight Graphics)	£26.04
Disc Tree 2 (Mitre Hard Disc Utility)	£39.95
DESKTOP OFFICE (Minerva Integrated Package)	£99.00
Euclid 2 (3D Drawing)	£57.95
E-Type (Driving Simulation) / Designer each	£14.95
Family Favorites (Minerva Compilation)	£14.95
First Word Plus V2 (Acorn)	£79.95
Fireball 2 (Superb breakout clone)	£19.95
FONT FX (Effects for Draw/Impression)	£8.65
Genesis (Hypermedia System)	£79.95
GRAPHBOX with Hotlink to PDream 3	£69.95
Herewith the Clues (Murder Adv)	£22.95
Holed Out (Golf Game)	£14.95
Holed Out Extra Courses , Designer each	£12.95
HOSTAGES (Superior)	£14.95
Ibix the Viking (Arcade Adventure)	£15.95
IMPRESSION 2 (Document Processor)	£149.00
IMPRESSION JUNIOR (Easy DTP)	£95.00
INERTIA (4th Dimension)	£14.95
INTERDICTOR 2 (Flight Simulator)	£27.95
Investigator (The Best Disc Copier)	£24.95
Mini Hyperpacks (3 games per pack) No's 1 to 6	£19.95
Hyperpack (12 Games)	£79.95
Maddingly Hall (Minerva Adv.)	£12.95
MANCHESTER UNITED	£22.95
Multistore Database (Minerva)	£199.00
NEVRYON (Unbelievable Graphics & Gameplay)	£24.95
OVATION (Beebug DTP)	£79.00
PC Emulator + free PCE Sh/ware 1&2	£99.00
Pipedream 3 (WP)	£129.00
PIPE MANIA (Addiction beyond belief)	£17.35
ProArtisan (256 Colours)	£79.95
REDSHIFT (Minerva scrolling arcade)	£14.95
Render Bender (Clares)	£59.95
Render Bender Demo Discs	£10.00
RHAPSODY (Clares Music package)	£34.95
Rotor (Arcade Strategy Game)	£19.95
Superior Golf	£14.95
System Delta Plus (Minerva)	£69.00
Talisman (Minerva Graphical Adv.)	£12.95
TEMPEST (Clares DTP)	£99.00
The Guild of Thieves (Mag.Scrolls Adv.)	£26.04
The Pawn (Magnetic Scrolls Adventure)	£26.04
Thundermonk (Arcade Adventure)	£14.95
Trivial Pursuit (Board game)	£24.95
U.I.M. (Submarine Battle)	£24.95
Worra Battle (Oak Tank Battle)	£14.95
WorraCad (Oak 2D Draughting Package)	£75.00
Worra Plot (Draw/HPGL Plotter Driver)	£24.95

How to find us



Hours of Opening
Monday - Friday 9.00 a.m. - 5.00 p.m.
Saturday 10.00 a.m. - 5.00 p.m.

NO Carriage Charges in Mainland UK

Acorn Qualified Dealer
Educational Specialists

TEL: 061 766 8423

SEE PAGE 134 FOR SOFTWARE SHOWCASE

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774   Tlx: 8956095   Fax: (0923) 33642
Shop Hours: 9am to 6pm (Mon.-Sat.) Thursday 9am to 8pm. FREE customer car park.
All prices exclusive of VAT; subject to change without notice & available on request.
Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

Acorn — The choice of Experience

The choice before and after the experience

Archimedes micro

System	Basic	Mono	Colour	Multiscan
410/1	£1099	£1159	£1288	£1488
420/1	£1299	£1359	£1478	£1648
440/1	£1699	£1759	£1799	£2048

12 MONTHS FREE MAINTENANCE ON SITE

Archimedes A3000

- A3000 Microcomputer £599
- A3000 + Learning Curve pack £699

- 3.5" External Drive £99
- Monitor Stand £22
- External Podule Case £13
- Serial Upgrade £17
- A3000 Technical Manual £29
- Dust Cover Micro only £5
- Dust Cover for Micro + Monitor £9
- User port/MIDI upgrade £45

Unbeatable Sale Offers on Archimedes Micro

(Extended by Popular Demand)

When you purchase an Archimedes Micro from Watford, look what you get FREE with it

Micro	Free Offer
A410/1	Upgraded to 2MB RAM & a 20MB Hard Disc, (A420)
A420/1	Upgraded to 4MB RAM 40MB Hard Disc (A440) + MK II Learning
A440/1	High Res Multiscan Monitors + Archi Mk II Hand Scanner
A3000	Upgraded to 2MB RAM on board

+ 12 months FREE On-Site Maintenance

ACCESSORIES

- NEW Multitasking RISC OS £29
- ROM Podule (Computer Concepts) £45
- ROM Podule (C C) with Battery Backup £59
- 3.5" 800K 2nd Floppy Drive (305/310) £118
- 5.25" 800K external Floppy Drive £85
- I/O Podule (with Analogue port, User port, & 1MHz bus) £78
- MIDI add-on to I/O Podule £29
- MIDI Expansion Card £65
- Sound Sampler Mono (Armadillo) £129
- Sound Sampler Stereo (Armadillo) £166
- Sound Sampler Stereo /Midi (Armadillo) £186
- Chromalock Podule (Wild Vision) £275
- Econet Network Board £46
- Archimedes IEEE Interface Adaptor £269
- Dual RS232 Podule £195
- 16 bit parallel I/O Card £195
- NEW – Archi MK II Replacement Mouse £39
- PC Emulator NEW Faster Version £62
- Software Developers Toolbox £149
- Floating Point Unit £549
- SCSI Adaptor Expansion Card £169
- Keyboard Extension Lead £6
- 2 Podule Backplane £25
- 4 Podule Backplane £38
- Fan for above backplanes £8
- Archi Real-time digitiser £199
- RB2 – Archi Marconi Trackerball £46
- Risc Os Extras Software Disc £5
- Smoked Perspex Low profile Keyboard Cover £29
- Laser Direct package (CC) £875

NEW

8Meg RAM Upgrade for Archimedes A400 Micros

- R810 – A410/1 upgraded to 8MB £910
- R820 – A420/1 upgraded to 8MB £859
- R840 – A440/1 upgraded to 8MB £749
- R814 – R140 upgraded to 8MB £749

Turbo Charge Your Archimedes

Increase the speed of your Archimedes by a factor of THREE to SIX times (depending on the software you are running), with Watford's ARM3 Upgrades.

- ARM-3 20MHz Upgrade Board £349
- ARM-3 30MHz Upgrade Board £399
- MEMC 1A Upgrade £49

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

- **UP10** – to 2MB RAM + 20MB Hard Disc £229
- **UP15** – to 2MB RAM + 40MB Hard Disc £334
- **UP20** – to 4MB RAM + 20MB Hard Disc £335
- **UP30** – to 4MB RAM + 40MB Hard Disc £445
- **UP40** – to 4MB RAM + 53MB Hard Disc £515

Archimedes RAM Upgrade

All our memory upgrades are simple to fit. No soldering required.

- **R302**-A3000 – to 2MB RAM Upgrade £70
- **R304**-A3000 – to 4MB RAM Upgrade £199
- **R311**-A305 – to 1MB RAM Upgrade £99
- **R312**-A305/310 – to 2MB RAM Upgrade £245
- **R314**-A305/310 – to 4MB RAM Upgrade £449
- **R412**-A410/1 – to 2MB RAM Upgrade £65
- **R413**-A420/1 – to 4MB RAM Upgrade £120
- **R414**-A410/1 – to 4MB RAM Upgrade £173

(Carriage on Add-ons £3)

Watford's 20Meg & 40Meg Archimedes Hard Disc

Watford's Hard disc drives for A310 & A410 series fit internally into the space provided. The 'simple to follow' fitting instructions supplied makes drive fitting very easy. All disc drives are self parking. 40Meg & 53Meg drives are fast 24mS type, while 20MHz are 28mS.
P.S. A310 upgrades require a backplane and a fan.

- 3HDP – Hard Disc Podule only £135
- 3HD20 – 20Meg H' Disc + Podule for 310 £299
- 3HD40 – 40Meg H' Disc + Podule for 310 £399
- 3HD50 – 53Meg H' Disc + Podule for 310 £474
- 4HD20 – 20Meg Hard Disc for 410 £169
- 4HD40 – 40Meg Hard Disc for 410 £269
- 4HD50 – 53Meg Hard Disc for 410 £339
- A3000 20Meg Hard Disc + Podule £359
- A3000 40Meg Hard Disc + Podule £489

(Carriage £7)

Silicon Vision Corner

Data Vision	£74	Film-Maker	£59
Gerber Plot	£93	Office Tools	£219
Risc Basic	£74	ROBO LOGO	£54
Solid CAD	£74	Share Holder	£74
Super Plot	£20	Solids Render	£54
Super Dump	£20	Solid Tools	£199
Arc PCB Professional	£275		
Realtime Solids Modeller	£110		

Desk Top Publisher

- **Acorn's Archi DTP Package £125**
- **Impression DTP Package £135**
- **Impression 2 DTP Pack £165**
- **Impression Junior £79**
- **Tempest DTP Package £99**

ARCHI WORDPROCESSORS

Wordwise + Disc	£24	P.Spellchecker	£40
Image Writer	£25	View	£45
Interword Disc	£24	Viewindex	£12
1st Word Plus – 3	£69	Graphic Writer	£23
Archie Spell Master	£39	EAS!WORD	£30

DATABASES

AlphaBase	£36	Multistore	£195
Knowledge Organiser	£45		

SPREADSHEETS

Intersheet Disc	£24	Viewsheet	£45
Sigmasheet	£55		

BUSINESS GRAPHICS

GammaPlot	£39	Sigmaplot	£39
Interchart Disc	£20		

INTEGRATED PACKAGES

- Logistix £85
- Pipedream 3 £120
- Desktop Office – Database, Graphs & Charts, Wordprocessor, Spreadsheet, Communications £105

GRAPHICS, ART, DESIGN & GAMES

GRAPHICS

Atelier	£65
Artisan II	£54
Pro Artisan	£72
Autosketch II	£68
Graph Box	£64
Kermit	£46
Render Bender	£54
Render Bender 2	£–
Euclid 2	£52
Mogul	£19

GAMES

Alerion	£11
Arcade 3	£11
Apocalypse	£23
Arcade Soccer	£15
Bug Hunter	£14
Battle -Tank	£14
Clares 3 Pack	£12
Class Mate	£35
Conqueror	£19
Enthar Seven	£22
E-Type	£15
E-Type Designer	£15
E-Type Extra 100 miles	£18
Freddy's Folly	£10
Freedom Fighter	£21
Holed Out Designer	£15
Holed Out Golf	£15
Hostages	£17
Hyperpack (12)	£79
Hoverbod	£11
Ibix the Viking	£14
Inter Dictor	£25
Inter Dictor 2	£27
Jet Fighter	£10
Knowledge Organiser	£49
Man at Arms	£15
Minotaur	£11
Missile Control	£11
Mogul	£14
Nevryon	£17
Olympics	£15
Orion	£12
Pacmania	£14
Quazar	£10
Real McCoy	£25
Redshift	£15
Repton 3	£17
Sporting Triangles	£24
Superior Golf	£17
Talisman	£14
The Pawn	£19
Thundermonk	£11
White Magic	£15
Xtra 100	£15
Zarch	£13

Miscellaneous

Armadeus Sound	£69
Arccomm Pack	£24
BBC DFS Reader	£15
Genesis	£65
Hearsay Comms Pack	£50
Laser Direct	£875
Rhapsody in Blue	£42
Toolkit (Clares)	£42

LANGUAGES (Archimedes)

ISO-PASCAL; FORTRAN 77	£77 each		
ANSI C Release 3	£125		
Assembler; LISP or Prolog X	£149 each		
LOGOTRON LOGO	£55		
ROBO LOGO	£49	TWIN EDITOR	£25
RISC BASIC	£85	BASIC Compiler	£77

MINERVA's Archimedes Software

Sigmasheet	£55	Sales Ledger*	£53
Home Accounts*	£36	Purchase Ledger*	£53
Stock Manager*	£53	Reporter	£29
Nominal Ledger*	£53	Mailshot*	£29
Ancestry	£59	MultiStore	£195
System Delta+	£55		
System Delta + Reference Manual			£25
Order Processing/Invoicing*			£53
School Administrator			£118

** Requires System Delta*

ULTIMUM – Archimedes A3000 Podule Racking System



- Accepts Standard Archimedes Podules – does not need special mini podules!
- Provides up to 4 Podule Expansion (including Hard Drive Podule)
- Internally mounted Podules (Neat & secured)
- Extremely simple to install – Just Plug in connections and go
- Built in mains Power Supply
- IEC mains o/p socket for monitor
- Internal Hard Disc Drive option
- Sturdy Steel construction in matching Acorn beige
- Full access to internal floppy drive & reset switch
- Convenient and attractive monitor stand

THE ONLY LOGICAL WAY TO EXPAND YOUR A3000 COMPUTER

The accepted standard for Archimedes computer expansion is the Acorn Podule, designed initially to fit the old 310, and also for the later A400 and A400/1 series micros. The podules fit inside these computers up to four at a time. The A3000 is the little brother of the family, but can only have one podule at a time, plugging into the back of the computer.

Other attempts have been made to expand the A3000 by trying to introduce a 'mini-podule'. This is impractical for many reasons, amongst which is the reluctance of manufacturers to produce them.I Nobody wants to re-design podules already produced. Some cannot be produced on a 'mini-podule' as they are far too complicated and simply wouldn't fit.

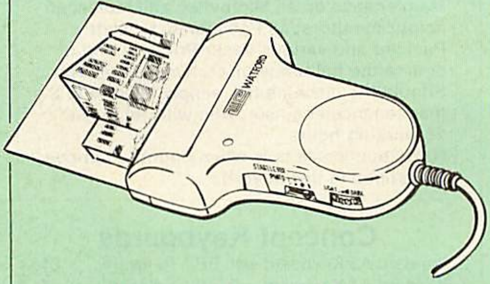
Watford Electronics listens to the demands and requirements of its customers, and we are glad to say that we have come up with the only real solution to the A3000 expansion problem. The ULTIMUM Podule Racking System allows up to three FULL SIZE standard Archimedes 300/400 series podules to be fitted to the computer. In addition, there is also provision for a hard disc drive podule and drive.

Since the ULTIMUM Podule Racking System takes proper full size podules, you will be able to use any of the currently available peripheral equipment, from companies like Computer Concepts, Armadillo, Acorn and of course, our own brand.

Fitting the podules to 'ULTIMUM' is simple. They are neatly fitted inside the metal case of the rack, avoiding the previously untidy method of hanging the podule off the back of the computer, risking damage to both, it and to the computer.

'ULTIMUM' has its own power supply, so no strain is put on the A3000 power supply. There is also an IEC mains output socket for an Acorn type monitor so reducing the number of plugs required to go to the mains. The ULTIMUM is rigidly clamped over the top and under the computer, and allows direct access to the floppy disc drive and reset button, rather than obstructing access as on other systems. One can also place a standard monochrome or 14" colour monitor (even a multiscan type) safely on top. The mounting method employed is so firm that the computer could even be safely transported without the assembly falling apart.

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system. The package includes the most comprehensive utility software available for the Archimedes, a high quality, ergonomically designed to fit the shape of your hand, (see drawing above) scanner, which is fitted with a warning LED that will indicate if the scanner is being moved too quickly for accurate results. Additional twin guide rollers ensure precise tracking over the image, to make the best use of the high resolution available with this sytem. The yellow/amber illumination of our Mk II scanner, enables you to achieve optimum accuracy. It is capable of scanning upto an amazing 400 DPI. The scanning area is 4" wide and the height is only limited by the maximu amount of memory available.

On board ROM software supplied, is the most sophisticated Archimedes scanner software yet written.

AHS-4	**Archi 300/400 Version**	**£149**
AHS-3	**Archi A3000 Version**	**£175**

Z88 Portable Micro



Only: **£195** (Carr £4)

FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

- 32K RAM Pack or 32K EPROM Pack £18.00
- 128K RAM Pack or 128K EPROM Pack £45
- 512K RAM Pack £175
- Z88 Eprom Eraser Unit £35
- Z88 Spellmaster for Pipedream £51
- Z88 Carrying Case £9
- Z88 Computing Book £9.95
- AA Nicad Rechargeable Battery £1.50
- Battery Charger Compact & Fast £6
- Z88 Serial Printer Cable £9
- Z88 Parallel Printer Cable £25
- Z88 to Archi Link £15
- Z88 to BBC Link £20
- Z88 to PC Link II £30
- Z88 to Macintosh £52
- Z88 Mains Adaptor £9
- Z BASE £56
- Z TAPE £42
- Z TERM £42
- Z88 Modem £149

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

By popular demand, we are now able to supply refurbished and fully guaranteed, Acorn range of Micros.
(Please telephone for price & availability)

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version **Only £15**

Archimedes 5.25"/3.5" Disc drive Interface

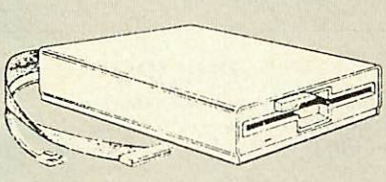
With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. NO SOLDERING is involved. Supplied complete with necessary lead.
Only £21

We are pleased to offer a limited number of Learning Curve packs at a very special price, to our customers who want to purchase them separately for use with their A3000 micros, that they bought prior to the launch of the pack.
Price Only: £99

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399***(carr £7)*

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.
FREE with every BBC Master purchased from us during September

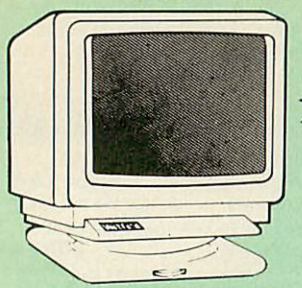
ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	£115
Econet Module for the Master	£47
Twin ROM Cartridge for Master	£9
Quad ROM Cartridge for Master	£14
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref Manual	(No VAT) £17
64K Upgrade Kit for B+	£32
Acorn 1772 DFS Kit complete	£49
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
Morley Teletext Adaptor with ATS Rom	£99
Filestore E01S £899	Filestore E40s £749
Filestore E60S £949	Ecolink £270

(Carr. £2 to £7 depending on the weight)

Continued→ → → → → → → → → →

MONITORS



12 months FREE maintenance on site

MICROVITEC 14"

- **1431** – Standard resolution as used on the BBC television computer programme £175
- **1451** – Medium resolution, suitable for word processing in mode 0 £219
- Cub3000 Medium Res for A3000 £195
- **1455** – MS Medium resolution, ideal for Archimedes £220
- **1441** – High res, exceeds the capabilities of the BBC Micro £359
- **1451AP** RGB + PAL and AUDIO £255
- **2030 CS** 20" Med Res £380
- **2040 CS** 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen** £239

14" MULTISCAN COLOUR

- **TAXAN** 775 Plus – 0.28 Dot pitch Ultra high resolution, anti-static screen £399
  scanning Ultra High Res £429
- **TAXAN** Multiscan 870 16" Monitor £575
- **PANASONIC** – 14" Super High Res. 0.29" Dot pitch, non glare screen. Built-in Swivel base **Launch price £349**
- **EIZO** 9060SZ Low Radiation, Super High Resolution, Antistatic screen, multiscan monitor for a wide range of applications. 800 dots x 600 lines. Display for high res VGA. 0.28 Dot pitch £409

PHILIPS

- **BM7502** 12" Hi-res Green Monitor £70
- **BM7522** 12" Hi-res Amber Monitor £71
- **CM8833** 14" Med. Res Colour Monitor £215

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £189

Dust Cover for Philips Monitors £6
(Securicor carriage on Monitors £7)

SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

£12

Spare Monitor Lead

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

FREE On-Site Maintenance

This month we are also offering at no extra cost to all our customers, 12 months, On-Site Maintenance on all Microvitec and Multiscan colour monitors; all Panasonic, Hewlett Packard and various Laser Printers; and of course the full range of Archimedes micros. Should the machine fail, simply telephone the maintenance engineer, who will call in within 12 working hours. (Offer applicable only when bought at prices advertised in this advert).

Concept Keyboards

Standard A3 Keyboard with BBC Software	£143
Standard A4 Keyboard with BBC Software	£117
Archi A3 Keyboard	£144
Archi A4 Keyboard	£118

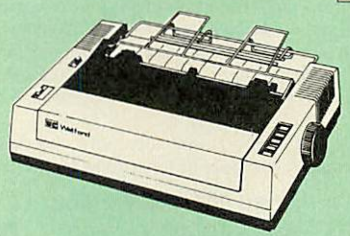
Roland Plotters

(Official Roland Appointed Distributor)

DPX 2500	£2435	**DXY 1100**	£545
DXY 1200	£715	**DXY 1300**	£925

Panasonic KX-P1081

12 MONTHS FREE MAINTENANCE ON SITE



SALE OFFER only: **£125**

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every KX-P1081 printer purchased from us)

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer lead.

Offer Price £134

Panasonic Printers

- **KX-P1124** 24pin 80col. 192/63 CPS £215
- **KX-P1540** 24pin 136col. 240/80 CPS £390
- **KX-P1592** 9pin 136col. 216/45 CPS £275
- **KX-P1595** 9pin 136col. 288/61 CPS £345
- **KX-P1624** 24pin 132col. 192/63 CPS £318
- **KX-P1640** £349
- **KX-P1695** 9pin 132col. 330/86 CPS £320
- **KX-P4420** NEW 8PPM Laser £949

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

BUFFERS

P12	4K buffer Board for 1081	£55
P42	32K buffer Chip for 1592/1595	£16
P43	32K Buffer Chip for 1540/1124/1180	£16

Serial Interfaces

P17	P1081/1592	£32	**P19**	P1124/1180	£55

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110	for KX-P1081, 1592 & 1595	£8
P115	for KX-P1180	£8
P145	for KX-P1124	£8
P140	for KX-P1540	£10

Colour Ribbons for KX-P1081, 1592 & 1595
Brown, Blue or Red **£9.95 each**

NEC Pinwriter Printers

- P2+ 24 pin 80 col 168/56 cps 8K Buffer £209
- P6+ 24 pin 80 col 216/72 cps 26 fonts £319
- P7+ 24 pin 136 col 1216/72 cps 26 fonts £379
- P6 Ribbon £8
- P7 Ribbon £10
- Colour option £74
- Serial Interface £73
- Cut Sheet Feeder £125

INTEGREX COLOUR JET

- Colour Jet 132 Printer £515
- Paper Roll £6.50
- Screen Dump Software £10
- Colour Cartridge £19.50
- Colour Textile Cartridge £29
- Black Cartridge £11.25
- Black Textile Cartridge £17
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

Citizen Printer

120D Plus	£105	Swift 9	£198
Prodot 9	£275	Prodot 24	£275
Swift 24	£245		
Swift 24 Colour Option			£34
Swift 24 Colour Ribbons			£13

Hewlett-Packard Printers

HP Desk Jet +	£475	HP Desk Writer	£620
HP Thinkjet	£250	HP Paint Jet Colour	£676
HP Scan Jet +	£1199	HP Quiet Jet Plus	£415
HP Desk Jet Cartridge			£14

Star Printers

- LC10 9pin 80col. 144/36 CPS £119
- LC10 Colour 9pin 80col. 144/36 CPS £158
- LC10-II 9PIN 80col. 180/45 CPS £145
- LC15 9pin 136col. 180/45 CPS £250
- LC24-10 24pin 80col. 180/60 CPS £185
- LC24-15 24pin 136col. 200/67 CPS £315
- XB24-10 24pin 80col. 240/80 CPS £379
- XB24-15 24pin 80col. 240/80 CPS £489
- XB-24 Colour Kit £35

Star Accessories

Cut Sheet Feeder

LC10/LC24-10	£65	LC15/LC24-15	£125
XB24-10	£80	XB24-15	£139

Serial Interfaces

SPC-10 LC10; LC10-II; LC10-Col; LC15; LC24-10; LC24-15	£49
8K Ser FR10; FR15; XB24-10; XB24-15	£64

BUFFERS

32K Ram Card for LC24-10 & 15	£55
32K Ram Card for XB24-10 & 15	£55

Ribbons

LC10; LC10-II; LC15 Black	£4
LC10 Colour Ribbon	£6
XB24-10 & XB24-15 Black	£5
XB24-10 & XB24-15 Colour	£12

LASER PRINTERS

Canon LBP-4		£849
Canon LBP-8 III		£1375
Canon LBP-8 IIIT		£1739
Canon LBP-8 IIIR		£1869
Epson GQ5000	6ppm	£860
HP Laserjet IIP	4ppm	£735
HP Laserjet IID	8ppm	£1820
HP Laserjet III	8ppm	£1199
Panasonic KX-P4420	8ppm	£840
Panasonic KX-P4450i	11ppm	£1185
Qume Crystal Print WP+		£759
Qume Crystal Print Ser. 2		£1069
Qume Crystal Print Postscript		£1979
Star LP-8 II		£1099
Star LP-8 II 2 Bin		£1535
Star LP-8 Star(post)script		£1575

Laser Toners

Canon 2	£60	Laserjet II	£79
Canon 4	£70	Laserjet IIP	£79
Epson GQ	£20	Panasonic	£29
Star	£–	Qume Crystal	£25

Laser RAM Upgrades

HP Laserjet II RAM		GQ5000 512k		£99
Jetware II 1MB	£175	KX-P4420	1M	£249
Jetware II 2MB	£330	KX-P4450i	1M	£299
Jetware IIP 1MB	£199	KX-P4450i	2M	£575
Jetware IIP 2MB	£319			

Epson Printers

EX800	£410	LQ1050	£540
EX1000	£540	LQ1060	£649
FX850	£299	LQ2550+	£760
FX1050	£370	LX400	£129
FX1060	£679	LX850	£179
LQ400	£185	SQ850	£515
LQ850	£439	SQ2550	£789
LQ550	£269	TLQ4800	£1449
LQ860 Colour	£535		

CUT SHEET FEEDERS for

EX800/FX800/850/LQ800/850	£130
FX1000/LQ1000/1050	£175
LQ2550	£390
LX400/800/850/LQ400/500/550	£69

TRACTOR FEED for

LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/ FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

ACCESSORIES

- EX800/1000 Colour Option **£45**
- EX800/1000 Colour Ribbon **£14**
- LQ2500 Colour Option **£65**
- Multifont Card for LQ550/850/1050 **£95**

Epson Printer Interfaces

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM Parallel Lead 6'	£6
IBM Parallel Lead 5 meters	£13
IBM Parallel Lead 10 meters	£19
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Important Notice to All our Customers

Watford Electronics only supplies products fitted with British Specification 240V AC Mains 3 core cable with connections for Live, Neutral and Earth. We do not sell, nor intend to supply grey imports from Europe with incorrect 220V European mains connections (2 core cable!) which could be dangerous to the end user.

MEGABUFFER 256



The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm.**

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatiblity with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr £5)

Universal Printer Sharers/Changer

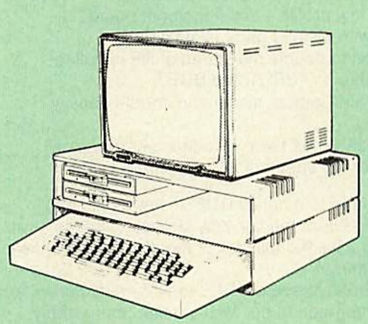
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	Serial	Centronics	P&P
2 to 1	£16	£17	£3
3 to 1	£22	£24	£3
5 to 1	£32	£–	£4

(Cables extra at £6 each. Please specify type required when ordering)

Plinths for BBC Micro, Master & Printer



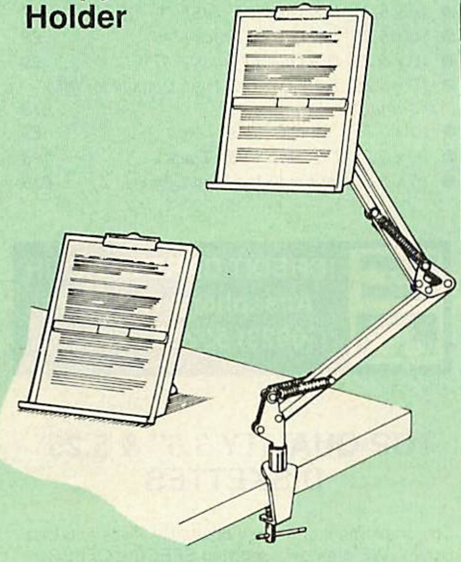
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm **£13**
Double BBC Plinth	420 x 310 x 210mm **£24**
Printer Plinth	420 x 310 x 105mm **£12**
Single Master Plinth	490 x 310 x 105mm **£14**
Double Master Plinth	490 x 310 x 210mm **£26**

(Carr. Single plinth £2; double plinth £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding you paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9.5" x 11" Fanfold Paper **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**
- Teleprinter Roll (Econo paper) **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

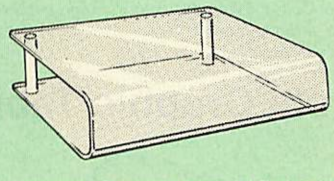
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	**£5.00**
1,000 90 x 36mm (Twin Row)	**£4.90**
1,000 90 x 49mm (Twin Row)	**£7.50**
1,000 102 x 36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

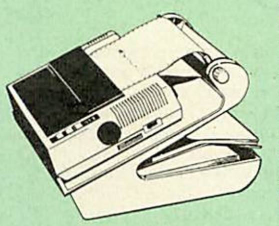
Perspex Printer Stand



Give you Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version **£16** (carr £3)
136 Column version **£20** (carr £4)

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £3)
132 Column version £28 (carr. £4)

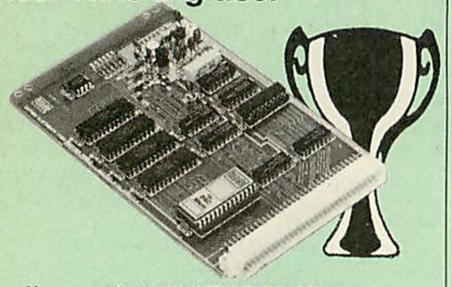
Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
Brother HR15/20	£3.50	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.95	£4.50
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£6.75	£5.00
RX/FX80/85/800/MX80	£3.25	–
FX/MX/RX100/1000	£5.00	–
Kaga/Taxan KP810/815	£4.90	£5.00
LQ500/550/800/850	£4.50	£6.00
LQ1050/LQ2500	£7.00	–
LX80/86/800/850	£3.25	£4.50
M1009/GLP	£3.80	£3.75
NEC P2200	£6.00	£5.00
Panasonic KX1080/81	£3.50	£4.75
Panasonic KX-1124	£8.00	£5.00
SQ2500	£23.00	£5.50
Star LC10/NL10	£4.25	£5.00
Star LC24-10	£5.00	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Continued→ → → → → → → → →

Archimedes Real-Time Digitiser



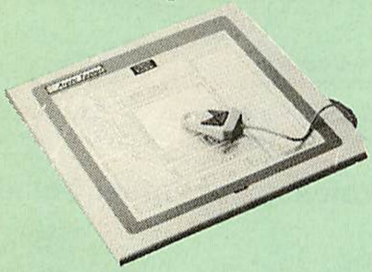
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £175

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic).
(FREE this month, PC Mouse Drivers & Art package)
(Now, fully LinCAD compatible. Recommended by Linear Graphic).
(FREE this month, PC Mouse Drivers & Art package)

Special Price £225

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£29**

DISC PLONKER RACK



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

● Watford sophisticated DFS ROM	£16.00
● Watford DFS Kit complete	£69.00
● We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
● DFS Manual (comprehensive)	£6.95
● Acorn DNFS ROM	£17.00
● Acorn ADFS ROM only	£25.00
● Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

● SPECIAL PRICE	£44.00
● DDFS Manual	(No VAT) £6.95
● We will exchange your existing DFS Kit for our sophisticated DDFS for only	£30.00

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

● *10 x 5.25" S/S D/D 40T (744)*	*£5*
● *10 x 5.25" D/S D/D 40T (745)*	*£7*
● *10 x 5.25" S/S D/D 80 Track (746)*	*£8*
● *10 x 5.25" D/S D/D 80 Track (747)*	*£9*
● *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT*	*£13*
● *10 x 3.25" S/S D/D 40/80 Track*	*£9*
● *10 x 3.25" D/S D/D 40/80 Track*	*£8*
● *10 x 3.5" Double Sided High Density*	*£18*

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

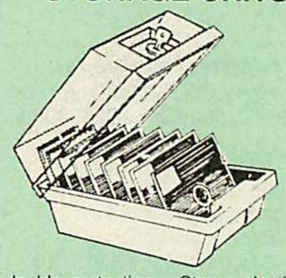
● *10 x **M3** 3.5" D/S D/D 80 Track*	*£8*
● *10 x **M9** 3.5" D/S High Density*	*£17*
● *10 x **M4** 5.25" S/S D/D 40 Track*	*£5*
● *10 x **M5** 5.25" D/S D/D 40 Track*	*£7*
● *10 x **M7** 5.25" D/S D/D 80 Track*	*£8*
● *10 x **M8** 5.25" D/S H/D Hi-Density*	*£13*
● ***M2** 3" Double Sided*	*£3 each*

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

ANTISTATIC LOCKABLE DISC STORAGE UNITS

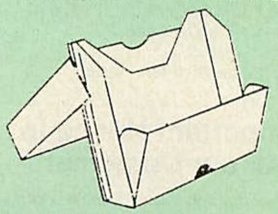


Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

● **M35** – holds up to 50 5.25" discs	£4.95
● **M85** – holds up to 95 5.25" discs	£6.95
● **M25*** – holds up to 25 3.5" discs	£4.95
● **M50** – holds 50 3.5" discs	£6.50
● **M10** – holds 8 of No. 10 Data Cartridges	£15

* Not lockable

PLASTIC LIBRARY CASES



Holds up to 10 5.25" Discs. **Only £2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

DISC ALBUMS

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special BULK OFFER on 5.25" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

PRICES SLASHED

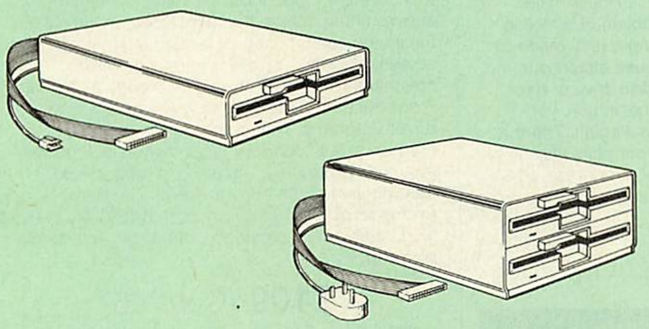
BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£30	£35	£40
● With Sleeves	£33	£38	£43

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.
The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
*Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. **Ideal for Schools & Colleges.** We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today!)*
When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. *(Turn to the 4th page of our advert for the Plinths).*
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £74		CS 400S £83	
800K (1,44M		CLD 800S £149		CD 800S £162

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £6 to £7

Prefix ***C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

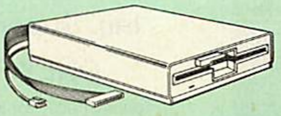
Suffix ***S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.

Refurbished Disc Drives now available
CLS400 £50; CLD800 £98; CS400 £59; CD800 £115

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

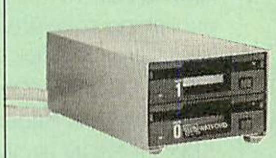
Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)

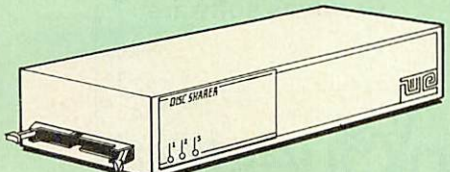
3.5" DISC DRIVE OFFER



These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU
● **CLS35 400K Unit £65** ● **CLD35 Twin 800K £119**
Drives with built-in Power Supply Unit
● **CS35 Single 400K £85** ● **CD35 Twin 800K £129**
(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

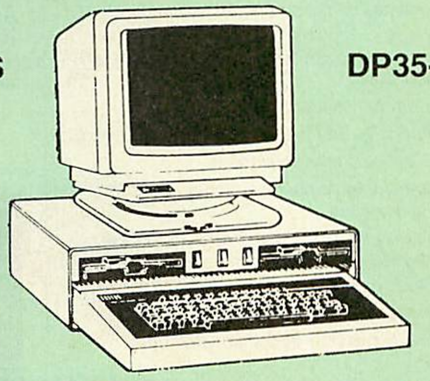
DISC DRIVE SHARER



(Ideal for educational establishments)
At last, a low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Offer Price : **£55** Price includes 3 Cables

CDPM 800S DP35-800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £175

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

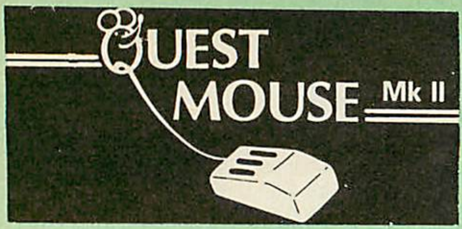
To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165

(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

Continued→ → → → → → → → → →



- Quest Mouse II & Quest Paint £58
- Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse II only £29
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Part Exchange your unreliable AMX Mouse for a Quest Mouse for only £22

(P.S. Quest Paint is not compatible with BBC Compact)



Winner of the BBC Acorn User 1990 Award for the Best Art/ Graphics software

ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

NEW

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £39

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£46

THE NEW Mk III AMX MOUSE

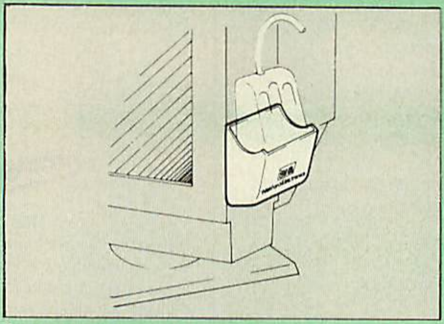
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

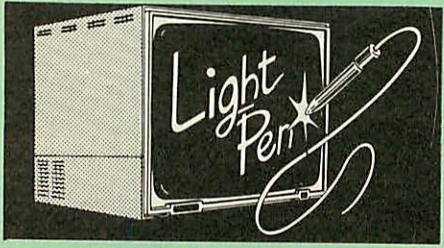
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE MOUSE HOUSE



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk. It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.

Price £4



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.
This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.
Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.
Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional ★ commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.
A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

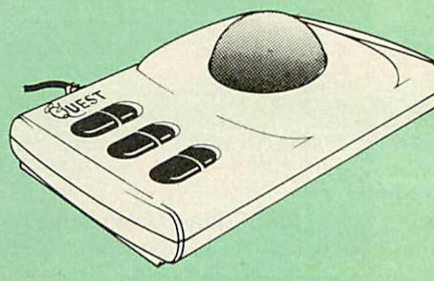
(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

NEW

QUEST – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version **£32**
QT-20 Archimedes Version **£35**





Winner of the BBC Acorn User 1990 Award for the Best DTP/ Word Processor

The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-paste, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

cont./-

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individully proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.

Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independantly or from within the Wapping Editor package.

Wapping Editor Software Pack	**£69**
Wapping Editor plus Mouse	**£89**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan
Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

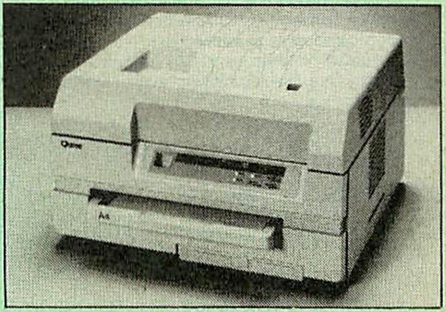
Beeb HandScan & Firmware	**£135**

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

£12

Laser Direct



By using the power of the Archimedes RISC processor, it offers the best of both worlds – print speed up to 5 times faster than typical Laserjet compatibles – uses outline fonts so that any font can be scaled to any size – works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, !Draw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/ envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Launch Offer: £875

(For demonstration, call in at our retail shop)

NEW

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed. Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual. (Will only work on 360K Disk Drives)

Price: £39

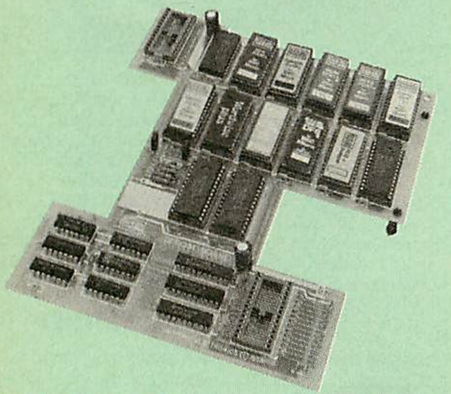
(Please write in for technical literature)

Continued→ → → → → → → → →

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/ Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accomodation is available to single persons if required. Telephone Keith Archer or Richard Overfield for interview, or write to us enclosing your CV.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

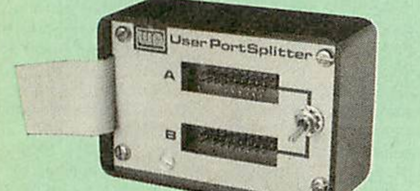
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

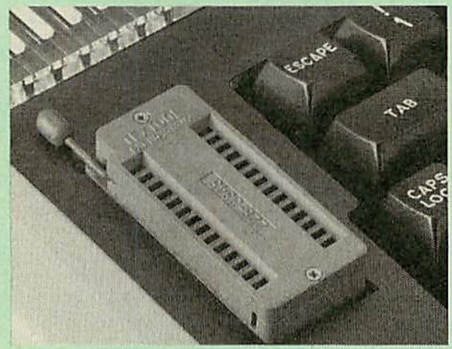
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.75**
● Spare Rack	**£1.65**

ROM Cartridges for the BBC Master
Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc
Twin **£9;** Quad **£14**

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for profressional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted **£3**

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as th printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

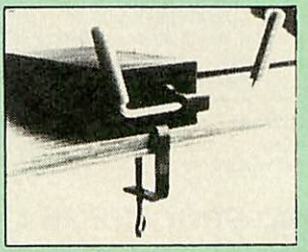
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

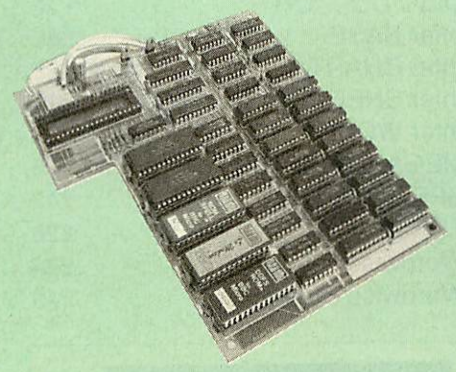
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM £48
- ROM/RAM card with 64k dynamic RAM £65
- ROM/RAM card with a massive 128k dynamic RAM £109

(carriage on ROM-RAM Card £3)

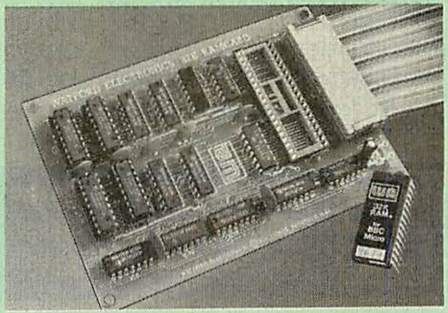
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £9
- 16k Dynamic RAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches .... £2 each

Complete ROM-RAM board All options installed £115

P.S.
IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)
(Price includes a comprehensive manual and the ROM)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer
Special Offer £18

Watford Electronics are:

- Acorn Qualified Dealer & Econet Referral Centre
- ARIES PC Dealer/Distributor
- Cambridge Computer Dealer
- Epson Silver Centre
- EIZO Monitor Dealer
- Microvitec Appointed Dealer
- NEC Appointed Dealer
- Panasonic Premier Dealer
- Roland Plotter Official Dealer
- Star Printer Sub Distributor
- Taxan Appointed Monitor Dealer
- 3M Media Premier Distributor

BBC SOFTWARE'S
Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £11.25
- Maths with a Story 2 (Disc). 4 further maths programs. £11.25
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. £17.00
- BONDING: Science (Disc) O-Level Chemistry £20.00
- ELECTROMAGNETIC SPECTRUM (8 Discs) O-Level program. £20.00
- ELECTRONICS IN ACTION (Disc) O-Level £19.95
- NEWTON & THE SPACE SHUTTLE (Disc) O-Level program. £20.00
- ECOLOGY (Disc) O-Level program. £20.00
- POLYMERS (Disc) O-Level program. £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20.00
- FOOD & POPULATION (Disc) O-Level £20.00
- MICROTECHNOLOGY (Cassette) O-Level £11.25
- DEUTSCH DIREKT! (Disc & Audio Cassette) £19.95
- Modem Master (Disc) £11.25
- ADVANCED TELETEXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20.00
- Astronomy – Primary (Disc) £12.00
- Computers at Work – Primary £17.35
- Introducing Geography 11-17 years £17.50
- Electric Fields 6-14 years £11.25
- Black Queen Contract Bridge £13.00
- Espana Viva – 3 Discs £19.95
- WHITE KNIGHT Chess game £16.00
- Inside Science £22.00
- A Vous La France £29.00

FUN SCHOOL 2 – Red: Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. **£12.00**

FUN SCHOOL 2 – Green: 6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump **£12.25**

FUN SCHOOL 2 – Blue: Over 8 yrs – Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. **£12.50**

- PUNCMAN Learning punctuation
  - Puncman 1 & 2 for 7 – 13 years £15
  - Puncman 3 & 4 for 8 – 14 years £15
  - Puncman 5 & 6 for 8 – 15 years £15
- Yes Chancellor – A chance to take over number 11 at Downing Street. 12 years+ £18
- Letters & Pictures – Introduces phonic skills to Infants 6-8 years £15
- Numbers & Pictures – Early number learning is a great fun (4-6 years) £15
- Note Invaders – Budding musicians can learn the notes on the Clef with this elegant game 3 programs (7 to Adults) £15
- Maps & landscapes No. 1 (9-14 years) £18
- Help Your Child learn Basic Map work No. 2 (9-14 years) £18
- Pirate – Educational Adventure (8-14 years) £15
- Spelling Week by Week (6-14 years) £18

Archimedes Software

- BUMPER DISC £14
- Bumper Disc 2 £14
- Bookbinder £43
- Craftshop 2 £29
- DigiSim £35
- Jigsaw £28
- Craftshop 1 £28
- Desktop Stories £27
- Droom £17
- Numerator £60
- Gate Array Teaching System £68
- Fun School 2A Red (up to 6 years) £14
- Fun School 2A Green (6-8 years) £14
- Fun School 2A Blue £14

Continued→ → → → → → → → → →

VIEW 3.0 ROM	**£45**
VIEW PROFESSIONAL	**£50**
VIEWSHEET (Acornsoft)	**£36**
VIEWSTORE	**£36**
VIEWSPELL with 80 track disc	**£25**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£20**
VIEW-INDEX	**£12**
OVERVIEW packs 1 & 2	**£65**
HI-VIEW	**£38**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	**£8**
Juki & Brother HR15 (Disc)	**£8**

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

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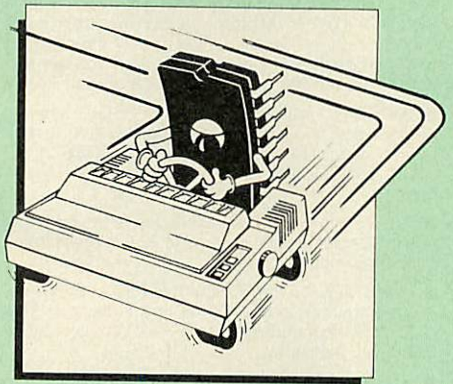
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DISC Version for BBC B & B+	**£14.00**
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VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing at only a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

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Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

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- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

BOOK

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

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If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

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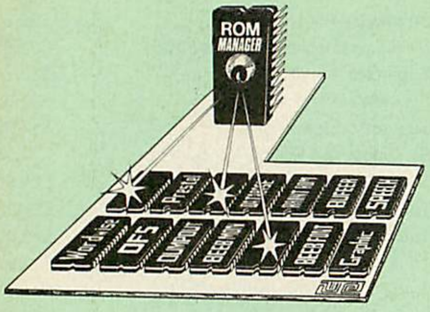
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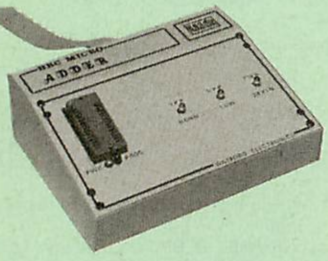
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Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs . Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

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The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
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- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£65 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£32**(carr £3)
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This 415MI, king size multi-purpose foam cleaner spray is ideal for cleaning the Keyboard, Monitor, Disc Drive and your computer furniture surfaces. Simply spray on the surface to clean and wipe off with a clean cloth.

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Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/ Monitor Screens.

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This simple to use aerosol spray is ideal for removing Dust and Dirt deposits from the Keyboards and similar inaccessible places. **£3**

SPARES for BBC Micro

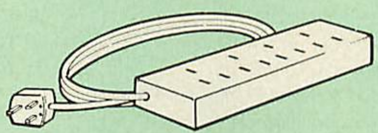
BBC Refurbished Keyboard	£46	Speaker	£3
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Protection for only **£8.50**

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Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ keyboard

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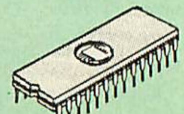
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Microtext Disc	£46
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ARIES PC 386-SX



The Aries PC 386-SX combines many of the powerful features of the 386 system with the frugality of a price tag more at home on a 286 system. With 8/16MHz CPU, this system provides virtually full 386 performance, including the more convenient scheme of memory control that allows easy configuration of expansion RAM as EMS for DOS application.

Features:

- 80386-SX CPU with optional 80287/80387 Maths Co-Processor
- 8/16 MHz selectable speed
- Legal Bios with built-in Setup routine
- For OS/2 and XENIX
- On-Board EMS

Specifications:

- 1MB RAM on-Board expandable to 16Meg
- 1 x 5.25" – 1.2Meg Drive fitted
- 1 x 3.5" – 1.44Meg Drive fitted
- 40Meg 28mS Hard Disc Drive fitted
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- 102 Key Keyboard
- Case with Keylock
- Eight expansion slots
- Two Serial and Parallel Ports
- Logitech mouse
- MS-DOS 3.3 & GW BASIC
- 12 months On-Site maintenance
- FREE £300 worth of Software/Hardware

Special prices:

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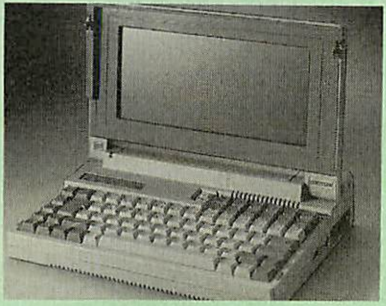
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(for IBM PC, Amstrad 1640 & Compatibles. Supplied complete with case, cables and power supply. Ready to plug)

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PCS-5H2	5.25" – 1M2 Cased Drive	**£99**

ARIES P20-HD PC Portable

Full Desktop PC Power For People On The Move



Imagine an IBM PC compatible laptop that can fit inside your briefcase (with room left over), so light (just over 7 pounds) that it is easy to carry wherever you go, and a choice between AC and rechargeable battery power, so you could use it any-where. The Aries portable has made your dream a reality with the world's most powerful compact Laptop. Also it is the FIRST COMPACT PC PORTABLE, incorporating a HARD DISK at under a £1,000.

The Aries portable has an energy-efficient 80C88 micro-processor that runs at 10MHz, a built-in high-capacity high speed, 20MB Hard disk drive, 1MB RAM, an advance LCD display, and a standard full-size keyboard with comfortable tactile feedback. The Aries Portable also has a full complement of six built-in ports (two RS232, one printer, one external FDD, one RGB monitor, one mouse), so you can add on extras wherever you settle down. All of this in a case so compact that it can easily fit inside your briefcase.

In his independent review (Computer Shopper, May 1990), the reviewer writes, – "Overall, the single most outstanding feature has to be the price tag. A notebook PC, with a hard disc selling for below £1,000 has no competition at the moment. If you have a small briefcase, weak arms or just like the concept of a truly portable computer then this is your man".

Just read the specification . . .

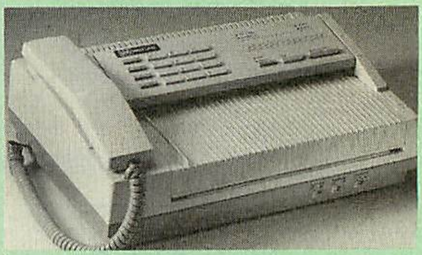
- **Processor:** 80C86 running at 10MHz Real time clock/calendar
- **Memory:** 1MB RAM (640K,384KbLIM/EMS)
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EIGHT BITS

£5 ONE LINER

Paul de Sa from Newcastle-upon-Tyne has produced a one-line graphics program which generates a screenful of Pickover-Truchet patterns (see *Scientific American* magazine July 1989).

These patterns involve joining two tiles, each nominally square with no border and containing two 90-degree arcs. One square has an arc travelling from the centre of the top border to the centre of the right border, and an arc from the centre of the bottom border to the centre of the left border.

The other square is a mirror image of the first. The program proceeds to tile the entire screen, selecting randomly between the two squares, and forming a 'maze' pattern.

The one-line program will only work on the Master or Compact as it uses PLOT 165, one of the extended plot commands, to produce the quarter-arcs.

You could of course modify the program so that it will work on the BBC micro using your own arc plotting routine, although the program will no longer be a one-liner!

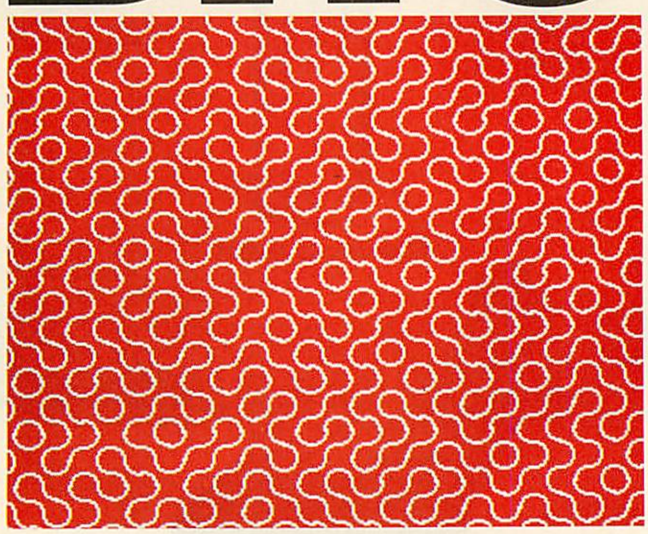
The regularity of the patterns can be explored by flood-filling the screen from various points. Whether you flood-fill the lined patterns or the remaining background area, you will still find that although most flood fills do reach the edge of the screen, the extent to which the flood fill covers the whole screen is very variable.

If you are using a Master or Compact, the best way to do this is to set the appropriate colour with GCOL (work in mode 1 and set GCOL 0,3 for the plotting, and GCOL 0,2 after the plotting but before the flood-fill).

The fill is performed with PLOT 133, x,y where x and y are the co-ordinates of the start point.

Note that the one-liner is almost a full 255 bytes, which is the maximum line length when it is tokenised. It is in fact even longer than 255 bytes when the BASIC tokens are fully expanded. This means that it can only be typed in using abbreviated keywords (see the actual one-line program above).

This will automatically expand to the full listing when you LIST it.



```
10MO.4:V.19,0,1;0;:F.X=0TO1250S.50:F.Y=0
TO1000S.50:IFRND(2)=1 MOVEX,Y+50:MOVEX,Y+25:
PL.165,X+25,Y+50:MOVEX+50,Y:MOVEX+50,Y+25:PL.
165,X+25,Y:N.:N.:EL.MOVEX,Y:MOVEX+25,Y:PL.165,X
,Y+25:MOVEX+50,Y+50:MOVEX+25,Y+50:PL.165,X+50,
Y+25:N.:N.
```

The one-line program and its resulting graphics

£10 NEW MODE 3 AND 6

Michael Brown from Cambridge has written a useful routine to provide a new version of modes 3 and 6.

When Michael is working on a program or writing a letter in *View*, he prefers to work in mode 3 with the screen in inverse video, Mac (and Archimedes) style.

He has provided a routine which changes the colours and deletes the gaps between the lines that occur in modes 3 and 6, without losing the benefit of the 20 percent memory saving over modes 0 and 4.

The routine was written so that you had to call it every time you entered modes 3 and 6, but Michael has made it work so that it will automatically change the colours and take out the gaps every time these modes are selected.

Using a green screen monitor, he prefers to use cyan as a background colour because it isn't as bright as white, but the background and foreground colours can be changed by altering the setting of forcol% (the foreground) and bakcol% (the background) at the beginning of the program.

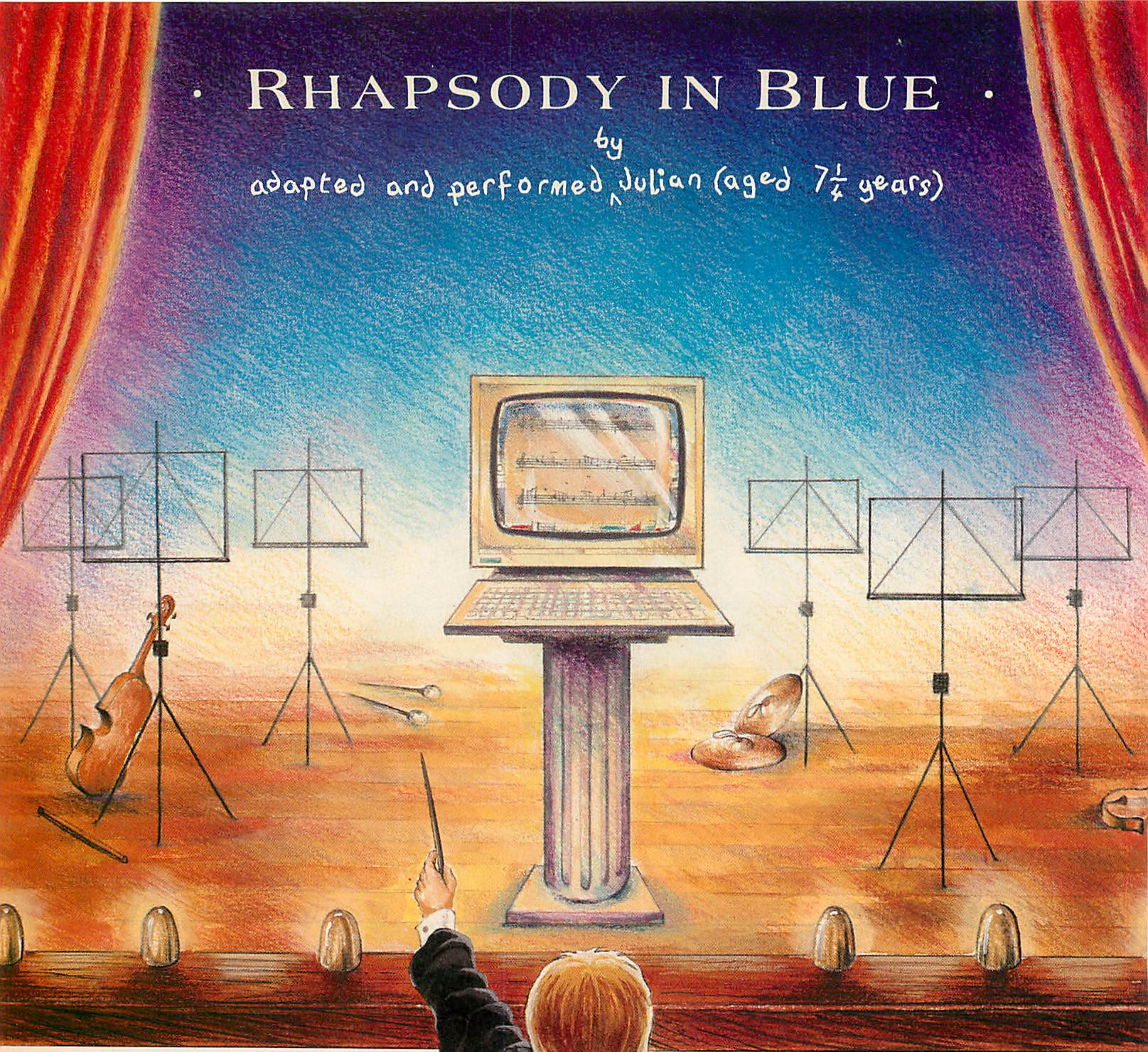
The program's automatic effect occurs by trapping the MODE call, which passes through the OSWRCH vector. To cancel the effect, and restore the normal modes 3 and 6, restore the standard OSWRCH vector by pressing BREAK.

RUN the program to install the special code. You can then enter VIEW and type NEW and load or type in another program. Whenever you type |MODE 3 or MODE 6, or your program selects these modes, the colours will change. Instead of the usual gaps between the lines, the screen will look like a mode 0 or mode 4 screen.

As modes 3 and 6 only have 25 text lines, instead of 32 as in modes 0 and 4, the program adjusts the screen so that the 25-line area is vertically centred, with a small gap above and below the text area.

This method of operation has two additional advantages. When plagued by one of those monitors in which no amount of *TV commands allow both top and bottom lines appear clearly on screen, this program will remove the problem.

Alternatively, if you have



Gershwin, Mozart, Vivaldi, all scribbling away, frantically composing their masterpieces, oh, to have had something a little more practical than pen and ink.

Imagine their delight had they seen Rhapsody. A new music notation package from Clares that allows you to write and modify musical scores in much the same way as a word processor allows you to manipulate text.

You can enter the music manually note by note. Or simply play the music in using a MIDI interface and a MIDI keyboard. Using a standard RISC OS printer Driver, pages, whole scores or individual parts can be printed out. What's more, Rhapsody also accepts Maestro files allowing Maestro scores to be played and printed.

As you would expect, Rhapsody enables you to enter dotted notes, triplets, staccato and accented notes, trills, repeats and much, much more. There is also the ability to add text, so you can easily add lyrics. And five scores can be open at once allowing you to copy data between them.

All of this can be replayed via a MIDI or an Archimedes sound system, it's childsplay, as successfully proved by Julian.

In short, it makes the labour of composing (noting, writing, correcting and changing) quick and easy, allowing you time to concentrate on the important part; the music.

Just think had Schubert had Rhapsody, perhaps his famous unfinished might have been finished. **PRICE – £49.95 (inc VAT).**

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Rhapsody developed with Silicon Vision's RiscBASIC Compiler.

plenty of room on the monitor, you can adjust the vertical size knob on your monitor in order to expand the visible screen to full size.

The program works by stacking all registers, then checking whether the code passed through WRCHV was 22 – the control code for a mode change. It also checks that the VDU queue is empty – if not, the 22 is part of a longer control sequence, rather than the start of a sequence.

If a flag is set, and the routine is exited, the routine tests whether the byte is 3 or 6, the two modes that are trapped.

If the mode flag is not set, this VDU code is not part of a mode command, so again, the routine exits.

If it is a mode 3 or mode 6 command, the normal mode change is executed and the colours are changed using VDU 19.

Finally, the clever bit happens – the 6845 CRTC. Three registers are altered: register 9 is set to 7, register 4 is set to &26 and register 7 is set to &1F. The first register creates the effect, cancelling out the blanks between each line.

Setting slightly higher values in register 9 produces small lines between each text line, smaller than the standard ones in mode 3. The value in register 4 may need to be adjusted to keep the vertical synchronisation as you start altering register 9.

Note that values of &21 and below produce a taller screen with expanded text. The third and final value does the same job as *TV, except that the effect is instant, without a mode change.

You can experiment with this in your own programs, with a routine such as

```
*FX4,1 REPEAT g=GET r=r-(g=139)+(g=138) VDU 23,0,7,r;0;0;0; UNTIL g=13
```

which will move the whole screen up and down instantly when the cursor keys are pressed, and exits with RETURN.

Although the routine changes colour when the mode is changed, colour changes can be cancelled by issuing a VDU 20 (or pressing CTRL-T) to restore the default colours and palette.

You can also set new colours in the normal way with a VDU 19 command.

£10 CASSETTE INLAY CARDS

Cassette inlay card printing programs never really achieved prominence. While everyone was busily writing such programs for users to catalogue the information on their computer cassettes, there weren't enough printers around to make the programs popular.

Then, by the time printers became more widespread, disc drives made computer cassettes rather old hat.

However, there is another dimension to cassette inlays, which is of course, the production of inlay cards for speech and music cassettes. **Graham Campbell**, from Hathern, is an organist, and has written a neat and tidy inlay card printing program. Type in the program from the yellow pages, or load it from the monthly disc, and RUN it.



First, you are asked if the inlay you wish to print is already stored as a file. If you answer in the affirmative, you are prompted for the filename. Otherwise, for each side of the tape, you are asked for the album title and artist, then the names of up to 12 tracks.

The program will limit each entry to a maximum of 31 characters to make sure nothing spills over on the tape.

If there are not a full 12 tracks on a side, just press RETURN to leave a line or lines blank. You can create also spaces between the track information by inserting blank lines at the appropriate points.

When you have made your entries for both sides of the tape, the program shows you how the complete inlay card will look. It copies the title and artist details onto the outer part of the inlay card.

If you need to amend any entry, you are given the opportunity at this point to return to edit mode, and alter any individual item.

(Note: you have to rekey the whole item, as there is no facility for full line editing).

When you are satisfied with the appearance of the inlay card, you are asked if you want to save it to disc. If so, you then press SPACE to print out the card. You are asked if you wish to print multiple copies, and if so, how many. Printing is best done on thin card, which can easily be obtained in A4 size from most stationers or commercial printers.

The best type is 115-150gsm card, and you can often obtain this in a range of colours.

When the inlay cards are printed, the outer lines are present, and these can be used as trim marks either with a guillotine or a pair of scissors.

If you produce a lot of cassettes, you may be interested to know that a firm called Industrial Process in Kent ((0795 428425) sell self-adhesive labels for the actual cassettes, with cut-outs for the holes, etc, on sprocket-fed rolls for use in dotmatrix printers.

```
 ---------------------------------------------------------------
 | Various                          Various                    |
 | 8 Bit Boppers                    8 Bit Boppers              |
 |                                                             |
 | Master Blaster                   Chain Reaction             |
 | Boot it Up                       View to A Kill             |
 | I Should Beeb so Lucky           Up the Function            |
 | I Heard it Through the Network   Memories                   |
 | Pixel Power                      Pump up the Ram            |
 | I Got You Beeb                   Communication              |
 | Another One Bytes the Dust       Modem Girl                 |
 | I Want a Break Key               I Did it for View          |
 |                                                             |
 |                                                             |
 |                                                             |
 |                                                             |
 ---------------------------------------------------------------
 | Various   8 Bit Boppers                                     |
 | Various   8 Bit Boppers                                     |
 ---------------------------------------------------------------
 |                                                             |
 |                                                             |
 |                                                             |
 ---------------------------------------------------------------
```

Printing cassette inlays

£10 WORDWISE PREVIEWING

Alan Hodge from Bexley uses *Wordwise Plus* on his unexpanded BBC and has written a utility to improve the previewing capability of this popular wordprocessor.

His program redefines a narrow character set (4x8 pixels per character) which allows 160-column previewing when 80 columns would normally be displayed, and 80 columns where 40 columns would be normal – thus alleviating the problem of having to previewing in teletext mode when the document grows too long.

The extra memory released is only about 8K, because even the new 80-column mode requires mode 6 to work, rather than mode 7 as used by *Wordwise* to perform normal 40-column previews.

To use the program, type in or load the program supplied in the yellow pages and on the monthly disc. This creates a machine code program called WWMEMEX. From the *Wordwise* menu, type *WWMEMEX and press RETURN. Nothing immediate will happen.

Work with Wordwise as normal, but when you want to preview a document, hold COPY down while selecting the preview option on the menu, and while answering the Y/N ques-

tion if previewing with markers. Press the COPY key first before making the menu selections, as you would a SHIFT or CTRL key. Once the preview starts, you can release the COPY key. If Wordwise would have previewed in 80-column mode, then it previews in 160-column mode. If it would have previewed in 40-column mode, it previews in 80 columns. If you don't like the preview in either of these special modes, simply press ESCAPE, return to the menu, and select the preview again, this time without pressing COPY.

An important point for large documents. Where *Wordwise* would normally preview in teletext mode, but you wish to view in 80 columns, there must be at least 7400 characters free in the documents (see the top of the editing screen).

If there isn't, then the attempt to select the special mode will delete your document. If you are in any doubt, save the document first.

This is a good idea anyway, because, as you may have already had the misfortune to discover, pressing BREAK during an 80-column preview tends to destroy your document.

As well as condensing the character set, the program also reverses the video mode.

This is because the thinner character set is much more readable when using an inverse video display.

Another effect of the program is that if you hold down COPY while selecting printing (as opposed to previewing) from the front menu, the printout is produced with double-line spacing (or, more accurately, with one extra line of spacing).

This can be useful in some circumstances, although there are other *Wordwise* commands that will do this anyway.

To remove the utility from memory, simply press BREAK. To reload it, type *WWMEMEX again, with the machine code file present on the current disc. Note that the utility is stored in memory from &1300 to &18FF, which is free when using DFS but is not free under ADFS or using a Master 128, so the program will only work on DFS BBC model Bs.

The program would not work on a Master anyway, because some of the special VDU code uses BBC specific locations, and the 640 time multiplication table present at &C375 in the BBC Mos is used.

This table is not present in the Master Mos.

The way the program works is fairly complex, but essentially it redirects all VDU output to itself, using the standard vector interception technique detailed in Michael Brown's example above.

£5 SWEDISH PRINTING

J W Brooks from Eltham in London writes in Swedish and rather than purchase additional software, which is fairly thin on the ground anyway, he decided to write his own program which works on virtually any nine-pin Epson-compatible machine.

The characters for curly and square brackets (opening and closing) together with backslash and vertical bar are the only characters which are changed. The three aspects to altering characters on the computers are:

- The character which appears on the keycap.
- The character which is displayed on the monitor.
- The character which appears on the printed output.

Mr Brooks has not chosen the characters for alteration at random. The above-mentioned characters all change automatically to Swedish characters when the Epson Swedish font is selected (with ESC "R" 5).

The translation (English character first is)

[(open square bracket) becomes Ä (capital A umlaut)

] (close square bracket) becomes Å (capital A prick)

{ (open curly brackets) becomes ä (lowercase a umlaut)

} (close curly brackets) becomes å (lowercase a prick)

\ (backslash) becomes Ö (capital O umlaut)

| (vertical bar) becomes ö (lowercase o umlaut)

So to effect c, all that is required is a once-and-for all issue of the ESC "R" 5 code at the start of the document.

For English or American character, use an appropriate ESC "R" command, and reissue ESC "R" 5 before the next Swedish-specific character is printed.

To effect b., the screen appearance, the characters involved must be redefined to their Swedish counterparts. This is done with a series of VDU 23 character redefinitions.

(Note that these are redefinitions of the main character set, so that if you haven't got a Master or above, you will have to 'explode' the character set using *FX20,5 (and raise PAGE by &500 bytes).

Mr Brooks issues the *FX20 command, redefines the characters and sets the Swedish font selection to the printer. The final part of the job to alter the keycaps is easily done with sticky labels.

Any other language font can be accessed in a similar way, by finding which US/English character codes are replaced by the relevant launguage font, and making the redefinitions to the screen characters, and if desired, the keyboard itself.

The only problem arises when the country-specific characters have an Ascii code above 127. This is because characters above 127 are not directly accessible from the keyboard unless you have a new Master Rom, Master Compact or Archimedes.

In such cases, one has to rely on either keyboard or printer drivers which translate one character to another.

If you have any hints or tips for the eight-bit range of BBC micros, particularly programs which enhance applications, or interesting algorithms in the field of graphics, recursion, artificial intelligence and so on, then please send them to: David Atherton, Eight Bits, BBC Acorn User, *20-26 Brunswick Place, London N1 6DJ. Please include a disc, especially if any program is provided, and please fully document your material explaining how it is to be used, and how it works. It helps if the documentation is also supplied on the disc.*

The ideal length of documentation is between 500 and 1000 words. Please also look at the last year or so in BAU*, particularly in this column, to make sure you aren't covering old ground. When supplying an improved version of an idea already published in the magazine, note that it is only likely to be published if it improves in function on the original, rather than simply in programming technique.*

If you want your material returned, a stamped adhesive label is more practical than an SAE, and easier to enclose.

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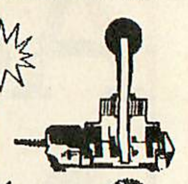
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EXILE	9.95	10.95	15.95
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....	6.95	8.95	10.50
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....	7.95	9.95	11.95
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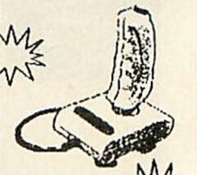


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BRINGING IT ALL HOME



Most children now have access to a computer at school. But having a computer at home as well can offer additional benefits, as LISA HUGHES explains

Education has always been an important part of the computer market, with BBC micros (from the model B to the A3000) currently in around 75 percent of schools. Educationalists continue to marvel at the 'computers in schools revolution' – however, most primary classrooms often have only one machine. And, although secondary schools are better off, information technology is rarely integrated right across the curriculum. So there is obviously room for much improvement.

The challenge to parents is to ensure that their children have the best possible access to information technology. Having a computer at home as well as at school obviously encourages a child's awareness of, and interest in, IT. And while there may be no cast iron statistics to show that children perform better if they have Arcs in their attics or Beebs by their beds, there can be benefits in computing 'homework'.

Determined parents should start by getting a feel of how micros are used educationally. If you work with computers at the office, you will have some idea of their power and capability for a range of tasks from wordprocessing to databases.

However, educational software can be much more colourful and exciting than packages such as *Wordperfect*.

The best place to start is obviously your child's school. If there is not much computing going on there – which may be exactly why you're interested in home educational computing – try approaching a local dealer for a demonstration. (Acorn can provide names of education specialists in your area).

Acorn also runs a scheme called the 'Home and School Initiative', designed to encourage parents to attend special dealer-organised evenings, usually held at schools. They offer the opportunity to watch an introductory video, see a demonstration of both hardware and software (such as Acorn's Learning Curve package) and chat to the experts.

(If your child's school has not organised such an evening yet, why not lobby the headteacher or PTA to set one up?)

There are other sources of information, including this magazine and trade exhibitions. The next big one is the British Education and Technical Training Exhibition (BETT) which takes place next January at London's Barbican. Parents are welcome.

After finding out what is available, the next step is to decide on the choice of hardware. The on-going debate in education concerns the so-called 'industry standard'. In other words, should children use IBM or IBM-compatible machines, running MS-Dos-based software, currently widely adopted in offices, or should they use 'dedicated' machines, such as the BBC micro or the Archimedes?

In a sense, it doesn't really matter. One important factor in the widespread adoption of the BBC machines is that they are good for learning computing on. Once these skills are acquired, a child can then go on to do far more sophisticated work, either on these machines, or on others. The choice really depends on application.

Obviously, there is a continuity advantage in having the same computer at home as your child uses in school. The vital point is that the child should learn flexibility and be able to handle whatever technology he or she may need in the future.

Some machines are easier to use than others. The current generation of computers operates through windows, icons, mice and pointers, so you don't have to work too hard to make the best use of them.

However, that doesn't mean older technology is totally redundant. There is still a fierce trade in secondhand BBC micros (no longer in production) and Masters, largely because there is still a wealth of educational software available for them.

The age of the childen will obviously affect your hardware choices – although, if they are upper primary or secondary school pupils, they will probably tell you which machine they want!

One decisive factor may be what type of computer your child uses at school. This can be especially important for older children who can bring a disc home to continue a piece of work and take it back to school the next day for printing out. Seek out your child's teacher or the school's IT co-ordinator for advice.

Perhaps as important (if not more so) is software. If you're looking at mainstream educational software, there are two broad types: subject-specific and generic.

Subject-specific software is intended for use in a particular area of the curriculum – for example, history or geography. This is not to say that other aspects of your child's education won't benefit too – 'cross-curricular' is a current buzz-word – and a history package can develop language and mathematical skills, as well as teaching a child about history.

Simulations are a popular sub-category of this type of software. They usually set up situations which users are asked to work



within and are designed to improve the user's decision-making capabilities or problem-solving skills.

In a classroom, a simulation might be used as either the basis or just one aspect of a specific topic – for example birds – and a teacher might ask a group of children to work collaboratively with the program. As such, simulations are valuable learning tools but not particularly appropriate for home use, unless children are motivated to carry out their own independent project work.

More suitable are what are known as drill-and-practice programs. This type of software doesn't really set out to teach children anything new – it works to enforce what they already know.

In a sense, such packages are comparable with chanting multiplication tables and many teachers frown on them. The better ones, though, are sophisticated enough to point the child towards the right answer when a mistake is made.

However, what you should really look at is generic, applications software like wordprocessing packages and art programs.

Teachers find that pupils who are reluctant to put pen to paper are much more motivated when asked to write on the computer – and this can happen at home in the same way.

There are many wordprocessors available which have been designed specially for educational use. Some use letter forms, which look like handwriting rather than typescript, and these are sometimes easier for children to relate to.

If you want to help get young children going with writing, let them just play with the keyboard – they can be fascinated by the way letters actually appear on the screen – or persuade them to tell simple stories which you type in for them.

As they get older they will be able to input their own writings and you could perhaps suggest that they keep a diary on disc. Essays, of course, are less of a chore on the wordprocessor because you can rewrite so easily and work looks so much more professional if it's done on a computer.

With the GCSE emphasis on presentation of project work, desktop publishing software might be something you could consider as well.

You can view art packages similarly. Those designed for very young children enable them to draw on a computer screen, using an input device such as a mouse, in the same way as they would draw on paper with crayons. More sophisticated programs produce more sophisticated results and can be extremely absorbing.

Obviously this sort of work raises the question of peripherals such as printers, which are essential for use with both wordprocessing and art software. Children need to have something tangible they can look at and keep. Ownership of a story or picture which they have created gives them pleasure and a sense of achievement, so when looking at systems for purchase, you need to budget for a printer.

Another add-on worth considering for younger children is a Concept Keyboard. This is a device which allows you to transform a standard Qwerty keyboard. For instance, by putting an overlay on it you can make one side register 'yes' and the other register 'no' which has clear benefits for children whose manipulative and language skills are not advanced enough to enable them to cope with the full alphabet plus complex function keys.

It's a well-worn cliche but, as most teachers will tell you, children pick up computing much faster than adults. They may need some initial help interpreting the manual but once pointed along the right route, they'll be off. In fact, there will probably be no stopping them.

Of course, it's slightly different with younger children but remember it's far more beneficial for them if you encourage them to discover for themselves rather than just telling them how to do a particular task. This is another instance when a word with your child's teacher about what approach to take is advisable.

If you want to turn your child into a programmer or systems analyst of the future, you might go about things rather differently. But, for most pupils, the insides of a computer are irrelevant. The reasons for having a computer at home are broadly educational – micros are tools for learning which can be used in any number of ways, with many educational benefits.

Finally, a computer is no substitute for healthy socialisation and it's not a babysitter. When working on a computer, your child can benefit from the individual attention you can give, so make it a shared, family activity. Above all, keep it fun, because that's what educational computing should be all about.

Acorn Computers can be contacted on (0223) 245200. For information about the BETT Show call EMAP Exhibitions on 071-404 4844. The Concept Keyboard Company can be contacted on (0962) 843322. Two educational software distributors worth contacting are AVP on (0291) 625439 and Rickett Educational Software on (0460) 57152. For others, see the regular advertisements in this magazine.



SPREADING THE WORD

JEREMY LAMEY preaches the advantages of using information technology to teach the faith in schools

There can be few less obvious curriculum partners than Religious Education and IT. PE teachers can use different sorts of pulse-measuring equipment, pen and paper subjects can wordprocess, cooks can record recipes on databases, CDT can use CAD packages, but RE and IT remain separate in most teachers' minds.

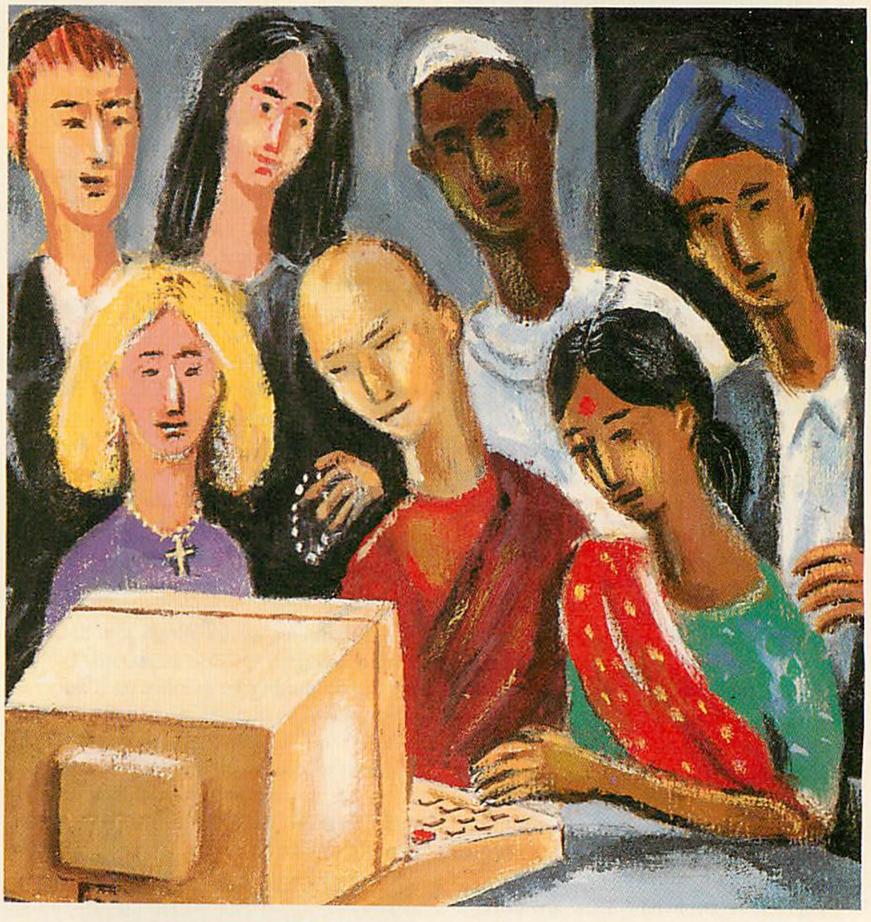
There are a number of possible explanations for this state of affairs. RE is seen by many as the poor relation: its budgets are small and its overheads low (bibles are cheap!) but it is a foundation subject and, as everybody knows, good foundations support a strong system.

There are few well known and worthwhile subject-specific programs in this area of study but they do exist for the resourceful to find. In this field, persistence has its rewards.

RE and IT suffer from the recent high incidence of other pressure-inducing innovations – GCSE, the National Curriculum, the lowering of teachers' self-esteem and so on – and perhaps there are just too many other things to worry about.

However, in order to reap the benefits, investment is necessary. RE teachers must give time to self-education. The benefit will be more time – less preparation and less marking – plus an increased level of student interest and greater effectiveness in the classroom.

Schools must support the RE teacher's endeavours by noting them, by rewarding them through increases in responsibility and salary and by redirecting finance to the RE department. LEAs, too, can redirect support in both professional and financial terms. They can contact advisers and pressurise them to supply training.



Investment must also come from the home. Parents must encourage their children, support the school and realise their power to create interest in RE and IT at governmental level.

These changes in current thinking will lead the hierarchy to realise the relevance of the subject and financial support will pour in. Is it possible to mix optimism and education? Well, it's different, as different as RE and IT!

The first priority is to ensure teachers' confidence with the equipment. This doesn't mean that those at the chalkface should know what happens underneath the keyboard but they should be aware of the limitations of their own knowledge and be prepared to ask for help – from other staff or pupils – should it be required. This aim can be accomplished through a few sessions of coaching from the IT specialist or a computerate colleague.

So, once the RE teacher has gained that confidence to grapple with IT, the software is the next hurdle. Is there any? Where can you get it from? How much does it cost? Yes, there are lots of sources for software and prices range from free to about £35+ for subject-specific, more if you want to use general purpose, software.

First steps

However, the key question is where do you start? Software for use in schools can be divided roughly into three categories: subject-specific, cross-curricular and general.

The meaning of the first is fairly obvious. The second refers to software that is usable in ways that link more than one area – for example humanities, technology packages and so on.

The third category comprises all the packages that could be used anywhere in the timetable – for instance, wordprocessors or desktop publishing packages.

It is my belief that the RE teacher should have, in his or her arsenal, a more diverse collection of teaching techniques than many others. The subject needs alert, active methodologies, whether you're using software, video, text books or 'chalk 'n talk'.

Consequently, uses for a wordprocessor should be inventive. It is only the sluggard who argues that a WP shouldn't be used in 'that' way. How many of us use the first tool at hand before using the correct one? Here are some suggestions that don't appear in the manuals.

Teachers can prepare cloze texts, to be completed either on file or on paper. They can create biased text files which can then be re-written on the wordprocessor for later publication.

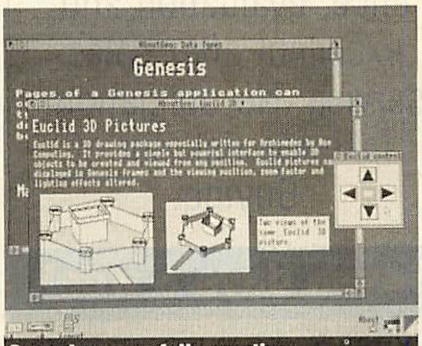
Alternatively, pupils can construct wordsquares, crosswords, worksheets, cribsheets etc, for other pupils to fill in.

Spreadsheets are not financial papers, they are screen-based work surfaces divided into cells. With this in mind, they make excellent research starters.

By asking questions that have many answers, children can be persuaded to limit the length of response to the cell area; make a single response rather than many (a stance that becomes defendable); and they can then be asked to justify their response, thus initiating discussion.

So, on the vertical axis of a spreadsheet key in three faiths and on the horizontal axis enter four questions. Founder? First prophet? Holy book? Country of origin? Some of these answers are obvious but others will generate debate and call for evidence to be offered, for example who founded Judaism and who was Christianity's first prophet?

The research is traditional but the stimulus is different and, even if the question is rejected, the activity is sound.



Genesis: powerfully creative

There are other reinforcers like hangman programs, wordsquare or crossword creators that are general sources but to the new computer-initiate, interesting and user-friendly.

Subject-specific software ranges from the inexpensive Christian Aid programs (*The Quiz*, *Mali Cattle Game* and *Rat Attack*) to sophisticated simulations like Appian Way's *Palestine in the First Century* or *Sand Harvest* from CWDE which cost a little more.

There are programs on Islam (*Hajj* from Hampshire County Council), *Christianity* (Evangelsoft has a range), *Judaism* (Ken Black's discs are available from the JEB), and ethics and moral education – *Making Choices*, from Appian Way, is among the best here.

Unfortunately I have been unable to find any specifically on Hinduism, Sikhism, Bah'aism or Buddhism – yet!

Checking it out

Religious software ranges from the magnificent to the dire, but even a small tool is useful for a small task so here are some pointers you might wish to look for in a program.

- Is it user-friendly? Are the instructions longer and more complicated than the average text-book?
- Does it have an RE perspective?
- Does the program use language acceptable to the faith it refers to and the pupils who will use it?
- Will you use it, not can it be useful?
- Does it have uses in your classroom, within your methodology and class rules?
- Would the activity be better done with paper or an overhead projector?
- What is the teacher's investment in terms of time and what will the rewards be?
- Is it value for money? One disc and two sides of A4 that keeps the class busy for three minutes for £25 might not be worthwhile.
- Work out what you want from a program and see if this one comes up to scratch. Devise your own set of criteria in consultation with colleagues.

The most exciting development reported by teachers and trainers in my travels has been the move of the Concept Keyboard from the special needs department towards general teaching groups.

However, the Concept Keyboard needs someone to invest time and money to produce overlays and active learning sequences. Also significant is *Genesis*, which is the most potentially creative format yet devised for the Archimedes.

However, the teacher must make the first move. He or she has to take the step of faith and put fingers to keyboards, ask questions and read a book or two. *Teacher Friendly* by Drage and Evans and *Using Computers Effectively*, edited by Blows and Wray, are ideal texts.

Religious education, if it deserves a place on the timetable, deserves the same support as other subjects and the same tools to do the task. If other subjects have access to IT, then so should RE.

Jeremy Lamey is an RE and IT consultant for Hampshire LEA.

PRODUCT DETAILS

- The Quiz *and* Mali Cattle Game *available on one disc, for BBC B only, priced £5, from Marketing & Resources Department, Christian Aid, P O Box 100, London SE1 7RT.*
- Rat Attack *available for BBC B only, priced £10, from Christian Aid at the above address.*
- Palestine In The First Century *and* Making Choices *from Appian Way, tel: 091-373 1389.*
- Sand Harvest *is available for the BBC range, priced £39.50 for 40T version and £54 for network version, from CWDE Software, CWDE, Regents College, Regents Park, London NW1 4NS.*
- Genesis *is available for the Archimedes, priced £100 (£81 to education) from Software Solutions, Broadway House, 149-151 St Neots Road, hardwick, Cambridge CB3 7QJ.*
- Hajj *is available for the BBC range, priced £7.50 from Hampshire County Council, Microtech Centre, Portsmouth PO6 4SJ.*
- *A series of BBC B discs, each containing an average of six programs on Jewish concerns, is available from the Jewish Education Bureau on 081-455 5018.*
- Teacher Friendly, *priced £14.95, available from Learning Development Aids, Duke Street, Wisbech, Cambridgeshire PE13 2AE.*
- Using Computers Effectively, *by Blows and Wray, is available from Scholastic Publications, Marlborough House, Holly Walk, Leamington Spa, Warwickshire CV32 4LS.*
- *A range of programs on Christianity are available from Evangelsoft, P O Box 224, Kingston on Thames KT1 2NX.*

AS NEEDS MUST

CHRIS DRAGE examines some of the input devices and software relevant for those with special needs



Simulations provide hours of pleasure

It is unfortunate both for young children and those with special needs that standard computer keyboards offer only a Qwerty arrangement. The Arc can be used in such a variety of ways that it is not necessary to use all the 107 keys for every application. Also it is unreasonable to expect keyboard skill to be a prerequisite for successful interaction with the software. Often this proves a stumbling block to the otherwise highly motivated learning that is possible with a computer.

Unlike the RM Nimbus, the Arc is supplied with a mouse as standard. Children with motor-skill problems are often able to deal much better with its 'chunky feel' as the speed of movement of the pointer is adjustable in relation to the movement of the mouse. Moreover, good software packages are available which produce superb results with a minimum of skill. A child who is trapped in the seemingly inevitable cycle of failure which sadly affects so many of our pupils, can be highly motivated to achieve success.

Two alternatives to the mouse, the Delta Cat and Trackerball were reviewed in the March 1990 issue of *BBC Acorn User*.

In terms of offering real alternatives for those with special needs they are a mixed bag. Anything that uses the mouse for control will work with the Delta Cat and Marconi Trackerball, each of which plugs into the vacated mouse socket. Two adjustments for sensitivity are provided on the joystick and the three buttons emulate the mouse buttons.

Although not desirable for applications like *!Draw* which require fine co-ordination, the Delta Cat will prove very useful in specific circumstances, especially if the joystick is firmly mounted and an extension tube is fitted over the stumpy control stick. In this fashion it can offer control via foot (buttons) and mouth (stick).

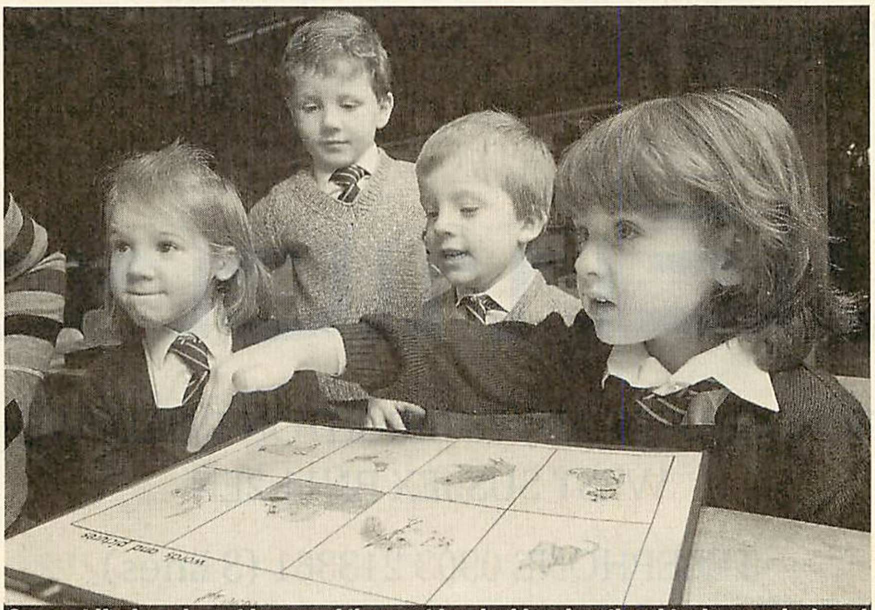
The Marconi Trackerball (called 'Marcus'), is an 'upside down mouse' possessing a large ball on top and three buttons corresponding to those on the mouse. The trick with this device is to manipulate the ball while holding down a button. Not easy at first! However, as the Trackerball remains stationary and control is gained using the fingers only, it may prove very useful for a disabled person who has fine motor control but lacks the gross movement of the arms.

As an alternative input device, the Concept Keyboard has had a major impact on computing in primary, nursery and special needs education. The Concept Keyboard scores heavily over other input devices because an overlay can be designed not only to look informative and attractive but also to provide the most appropriate input medium for any particular application. Before it can be used with an Archimedes, either an I/O podule (A410 – Acorn) or user port mini-podule (A3000 – HCCS/Morley/Acorn) must be installed.

Intercept, from the Concept Keyboard Company, comprises two software elements for creating and running an overlay program for the Concept Keyboard (similar to *Starset* (BBC B). A pre-release version of this Risc OS application looks very good indeed. Up to 256 keypresses can be programmed, simulating all possiblities. An overlay file is created by simply pointing, clicking and entering text as appropriate. Once saved, a module is loaded which executes the overlay file. Overlay files can even be created offering full access to the operating system from within an application, the only restriction being that no new applications can be started up. Overlay files can be created for a huge range of Arc software, freeing children from the constraints of the Qwerty keyboard.

For those whose only means of communication with a Beeb is their voice, the Micromike has proven a successful input device. The standard Micromike is handheld and styled like a CB microphone, while the desktop Micromike sits securely on any flat surface and is ideal for those unable to hold the standard model. Each Micromike gives voice volume control over a variety of activities and promotes vocal play and control of volume and timing of vocalisation. To use the device with an Arc an I/O Podule (A400/A310) or a user port/analogue mini podule (A3000 – HCCS or Morley) must be installed.

Although little Micromike software has yet been versioned for the Arc, Northwest Semerc has converted Allan Nixon's popular *Sid and Mike* software. This package comprises a suite of seven programs which encourages use of long sounds and repeated short sounds. Well received by speech therapists, the suite has found a niche



Concept Keyboard must be one of the most invaluable educational tools ever designed



Disabled children can enter the Olympics

with both those with speech disabilities and elective mutes. It features a 'walking' menu (controlled by speech), adjustable volume acceptance level and it works with switches.

Incidentally, anyone requiring specialised switches for use with their Archimedes should contact CJ Computers which designs and manufactures switches tailored to meet individual needs. It also does assessments, installations and servicing.

Software developments

The importance of the role of play as a vehicle for learning can be exemplified by *Blob*, a suite of programs designed specifically for children with special needs. *Blob 1* & *2* and *Count with Blob* are well known to many teachers. These titles have been reversioned and improved considerably for the Arc in terms of both appearance and program design. A large range of Archimedes' input devices is catered for and Concept Keyboard overlays are provided with *Count with Blob*. *Blob1* is concerned with the introduction of computers and switches while *Blob2* deals with selection procedures and making decisions and choices. *Count with Blob* helps children learn to count and provides experience of numbers in a wide range of circumstances. The graphics and animation are attractive and children gain much pleasure from these programs. Widgit Software is also preparing a series of SLD modules which will enable teachers to create a wide range of activities using graphic images and sounds.

Maths Pack 1 is a new package for the Arc primarily designed to help mainstream children at Key Stage 1 and serving Mathematics' ATs 2 (level1), 5 (level1) and 6 (level2). It is admirably suited for children with learning difficulties as its visually large menus and simple options make it easy for children to control the program and succeed. The suite comprises four programs concerned with matching, sorting and counting numbers to 10 (up and down). Options like size of sets and whether blanks are included are offered.

A datafile is kept of each child's monitored performance. This is stored on disc and presented graphically on screen, from which a printer dump (including a 'magnified' portion) can be obtained. The fast, high resolution graphics are really appreciated by children.

Jiglet is a simplified version of 4Mation's popular *Jigsaw* program. It is specifically designed for younger children and those who are unable to manage the complexities of *Jigsaw*. You can choose from one of 16 pictures which can be divided into four, six, nine or 12 pieces. Sprite pictures from art packages, digitisers and those captured by *Snippet* can be used with *Jiglet*.

To increase the difficulty, the reference picture can be 'turned off' and pieces can be randomly rotated. Partially finished jigsaws can be saved for later completion. *Jiglet* is an ideal alternative for those whose manipulative skills preclude them from handling real jigsaw pieces. Similarly, using relevant digitised images as a basis for a jigsaw will prove highly motivating.

Computer games too have their role to play, especially with older, disabled people. Here several established Arc favourites are making their mark: *Interdictor*, *Holed Out*, *E-Type*, *Soccer* and *The Olympics*. People with physical disabilities who are denied participation in these activities gain great pleasure and satisfaction from being able to participate in the computer simulation. The Arc's raw speed and graphic capabilities add a realism which is appreciated by people unable to experience the real thing. *Holed Out* and *E-Type* have the added bonus of available 'designer' versions which offer a creative dimension to the game scenario.

On a less esoteric note, Enabling Technology has developed a versatile, easy-to-operate, cost-effective information management system designed specifically for special needs education.

It consists of financial control, monitoring and projection, comprehensive pupil/staff record system (including National Curriculum recording), wordprocessing, diary and telephone directory systems and communications for telephone access to other computer systems. LEAs should sit up and take notice of this one.

Lastly, Hi-Flight Computing in Australia has embarked on a project using signing software for the hearing-impaired. Centring around the Watford Digitiser and running on an A310 or A400 series, it should prove a powerful tool for use in the teaching of signing.

As always, it is not possible to give more than a taste of what is currently available. As I mentioned last month, Northwest Semerc should be your first port of call for further information relating to the use of the Archimedes in special needs.

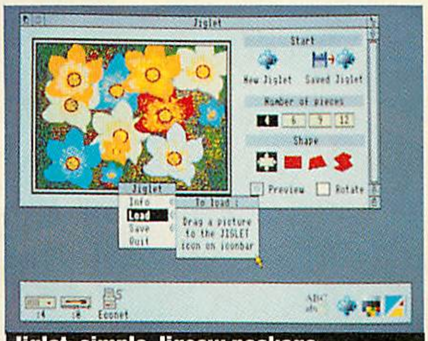
With the Archimedes series Acorn has provided a solid hardware platform on which a multiplicity of hardware peripherals and software for special needs is growing steadily greater.

SUPPLIERS

- Delta Cat is available from Voltmace, Unit 9, Bondor Business Centre, Baldock, Herts SG7 6NG.
Price: £29.95.
- Trackerball 'Marcus' is available from Technomatic, Techno House, 468 Church Lane, London NW9 8UF.
Price: £59.80.
- Micromike is available from Daco Software, Cornstone Building, 33a Westley Road, Birmingham B27 7UQ.
Prices: Standard Micromike £35.08 and Desktop Micromike £40.83.
- Concept Keyboard is available from The Concept Keyboard Co, SkMide Road, Winnal Industrial Estate, Winchester, Hants SO23 7RX.
Price: A3 (128) £132.39; A4 (128) £106.12.
- *Blob1*, *Blob2*, and *Count with Blob* are available from Widgit Software, 102 Radford Road, Leamington Spa, Warwickshire CV31 1LF.
Prices are £20.70 and £23.
- *Math Pack 1* is available from H.S. Software, 56 Hendrefoilan Ave, Sketty, Swansea SA2 7NB.
Price £11.95.
- *Jiglet* is available from 4Mation Educational Resources, Linden Lea, Rock Park, Barnstaple, Devon EX32 9AQ Price: £33.35.
- *Interdictor* is available from Clares Micro Supplies, 98 Middlewich Rd, Rudheath, Northwich, Cheshire CW9 7DA.
Price: £34.95.
- *E-Type*, *Holed Out*, *Soccer* and *The Olympics* are available from The Fourth Dimension, Dept 4444, 1 Percy Street, Sheffield S3 8AU.
Price: £19.95 each.

OTHER ADDRESSES

- CJ Computing, 3 School Close, Stoke Lodge, Bristol BS12 6DW.
- Enabling Technology Ltd, Hendglade House, 46 New Road, Stourbridge, West Midlands DY8 1PA.
- Hi-Flight Computing Services, 110 Mt. Pleasant Road, (PO Box 136), Belmont, Victoria 3216, Australia.



Jiglet: simple Jigsaw package

MESSAGE IN A BATTLE

Confidential data exchange can be a minefield. DAVE LAWRENCE shows how you can keep your secrets safe

Communicating with someone without a third party being able to understand your message calls for data encryption.

Applications for such secret message sending range from military, for controlling troop movements and strategy on the battlefield, to finance, where banks need to transmit transactions between cashpoints and branches without the illegal addition (or removal) of a few extra zeroes.

Public Key Encryption is a data encryption system first proposed in 1976 by Diffie and Hellman. This article describes the RSA system (Rivest, Shamir, Adleman, Communications of the ACM, 1978), introduced to try and overcome problems associated with 'classical' cipher systems.

In communications jargon, the message to be sent is called (surprise) the 'message', the means of encryption is the 'encryption key' and the resulting coded message is the 'ciphertext'.

If I simply refer to the 'key' it should be clear by the context whether I mean the encryption or decryption key.

The Caesar cipher is probably the simplest. It simply involves shifting all the letters in the message a given number of places in the alphabet (wrapping back round to 'A' after 'Z'). For example, to send the message 'ATTACK' with an encryption key of 10, you'd send 'KDDKMU'. It would be easy to crack this code.

In the monoalphabetic cipher each letter corresponds (uniquely) to another; eg:

```
A B C D E F G H I J K L M N O P Q
P L M O K N I J B U H V Y G C T F
R S T U V W X Y Z
X R D Z E S W A Q
```

This is more secure than the basic Caesar cipher, but is still easy to break by statistical methods – the use of letters in English is not uniform, with some letters more common than others.

So, given a ciphertext, it can be broken by working out its letter distribution and then matching the most common letter with 'E', the second with 'T', and so on. This will need some tweaking, but will be near enough right.

The Polyalphabtic ciper is essentially a Caesar cipher but uses a key 'word' rather than a single shift. For example, coding 'ATTACK NOW' with a key word of '12, 8, 1, 9' would produce:

```
A T T A C K N O W
+12 +8 +1 +9 +12 +8 +1 +9 +12
M B U J O S O X J
```

Note that both 'C' and 'N' are encrypted to 'O' and the two 'T's encrypt differently each time, masking to a certain extent the distribution. Believe it or not, this cipher is also easy to break.

Again statistical methods are used. These rely on the fact that the key word is repeated at regular intervals splitting the problem into, in the above example, four Caesar ciphers which are quite easy to break.

So, why not make the key word as long as the message and totally random? This is sometimes used and is called a 'One Time Pad' as each key can only be used once. Unfortunately the problems of generating a completely random key (not just pseudo random) are difficult to solve and then the key needs to be transmitted in addition to the actual message, doubling the sending time and increasing the risk of the 'enemy' finding the key.

Aims of the cipher system

The following six attributes are desirable in an effective cipher system:

- Confusion – each letter of the cipher text should depend (ie, be generated from) on many letters of the message.
- Diffusion – each letter of the cipher text should depend on many parts of the key.
- Non-linearity – the encryption algorithm should be non-linear, ie, not just a shift.
- Pseudo-randomness – the inherent redundancy of the English language should be difficult to find and make use of.
- Conciseness – a relatively short key is better (compare Caesar cipher and one time pad) for transmitting, remembering, etc.
- Openness – dispensing with the need for a secure line to broadcast the key.

Achieving these aims is easy – combining them is more tricky. Public Key Encryption goes a long way to doing this.

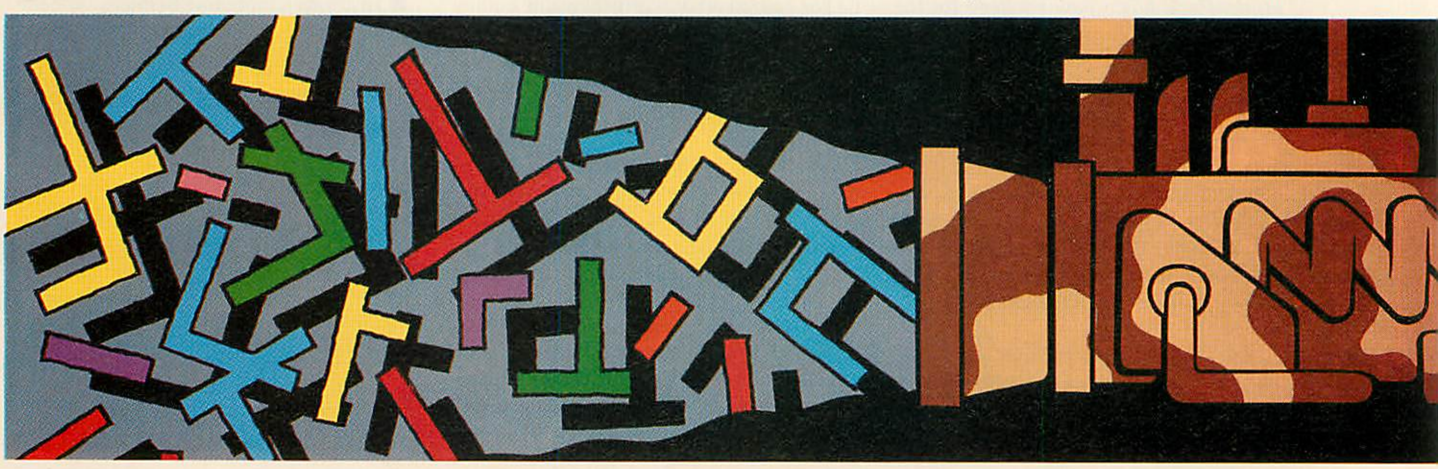
Even though this system is widespread and important, it relies entirely on a ridiculously simple principle – the computational difficulty of factoring large numbers.

Given a small number such as 63, it is easy to find its factors (9 and 7) using the Euclidean division algorithm. However, that system doesn't do quite as well with a number such as 2210063 (factors are 2083 and 1061) or a 200-digit number.

A recent estimate says factorising a 225-digit number could take over 29 million years – and that's using parallel processing. Therefore, this seems fairly safe to base an encryption system on.

This idea now needs to be built into the cipher along with as many of the six 'desirables' listed above. To create 'confusion' the message is first blocked into groups of letters, usually 64 bits long.

Taking Ascii codes as a useful standard



for converting text into numbers, this means blocks of eight letters, which are converted into numbers using their Ascii codes. When linked together, the codes produce a numeric representation of the message.

For example, (using 24-bit blocks), 'THE TREASURE IS HERE' would run:

```
1) THE TREASURE IS HERE
2) | THE | TRE | ASU | REI | SHE | RE |
3) &544845 &545245 &415355
&524549 &534845 &524500
```

A simple function is needed to apply to these numbers which can be passed on to the desired recipient, who will now be able to reverse the process and decode the original message. How is this possible? Well, two important theorems are needed – but first, a little notation.

If a, b and n are integers with n > 1, then a is said to be congruent to b modulo n if a-b is divisible by n. This is written:

```
a = b mod n
```

and is equivalent to saying

```
a = b + x n
```

where x is also in integer. Don't confuse this with the MOD operator in Basic.

The first theorem needed is the Chinese Remainder Theorem (CRT) which states that if m and n are co-prime natural numbers (ie, their highest common factor is 1), then there is an x such that:

```
x = a mod m
x = b mod n
<=> x = c mod mn
```

It can also be proved that if a = b, then c also has the same value, so

```
x = y mod m
x = y mod n
<=> x = y mod mn
```

The second theorem you need to look at is Fermat's Theorem which simply states that:

```
If p is a prime, then in modulo
p arithmetic,
np - 1 = n to the power of p - 1
np - 1 = 1
```

or, in congruences,

```
np - 1 = 1 mod p
```

For example, with n = 3 and p = 7,

```
37 - 1 = 36 = 729 and
729 = 104 * 7 + 1 or 729 = 1 mod 7
```

The useful upshot of this is that:

```
k = 1 mod (p-1) <=> nk = n mod p
```

You should now piece all this together. If you choose 'raise-to-the-power' as your encryption method (a nice, simple, non-linear function), you have

```
f(x) = xe
```

where e is your encryption key. You need to be able to find d the decryption key or power in the inverse function of f, f'.

```
f'(y) = yd
```

All calculation is done in base N, the product of two prime numbers p and q. Therefore, you need to find what e is in the following equation:

```
xde = x mod N
```

ie, given a number, after raising it to power e, what other power should it be raised to to get back to the original number?

```
=> xde = x mod p |
```

By Chinese Remainder Theorem

```
xde = x mod q
=> de = 1 mod (p-1)
```

By 'useful' part of Fermat

```
de = 1 mod (q-1)
=> de = 1 mod (p-1)(q-1)
```

By Chinese Remainder Theorem

This is all you need. You can now have d in terms of e, p and q all of which you know. But p and q is, in practice, impossible to calculate from N. To encrypt a message, it should be blocked, as above, each number raised to the power e and then sent in a convenient method (the ciphertext is often translated back into letters by treating the resulting number as a base 26 number and converting 0 to A, 1 to B etc).

So it is possible to make e and N public and tell anyone to use them if they wish to send a message – you can then decrypt the message, because you know what the decryption key d is. Obviously, p and q is kept private, otherwise anyone else could calculate d as well and break your cipher. That is all there is to it, apart from the problem of generating and testing large prime numbers, but I'll leave that for now.

There are other useful side effects of Public Key Encryption. For example, you can allow for unforgeable messages. If a message is sent from A to B, how does B know that it is really from A and not from C pretending to be A?

Well, if A first encrypts the message using a private decryption key before using B's public encryption key, B can decrypt it once using his (private) decryption key and then with A's public encryption key. If the message is a true message then it will make sense, otherwise it is forged!

The program on the yellow pages is a simple example of Public Key Encryption. It only uses small prime numbers and groups of two letters in the encryption process, but it illustrates all the important principles.

These restrictions are enforced by the limited capabilities of Basic's arithmetic. Even now you may occasionally get a 'number too big' error. If you do, don't worry – just run the program again.

PROCEDURES AND FUNCTIONS

PROCinit – defines a set of valid characters, the size of message blocks and the text of the message to send.

PROCpqnde – randomly chooses two prime numbers for p and q, calculates N and then picks some appropriate d and e. The RND(5) is included to vary the choice more, it is by no means essential.

FNprime – picks a random odd number between 33 and 231 and checks if it is prime.

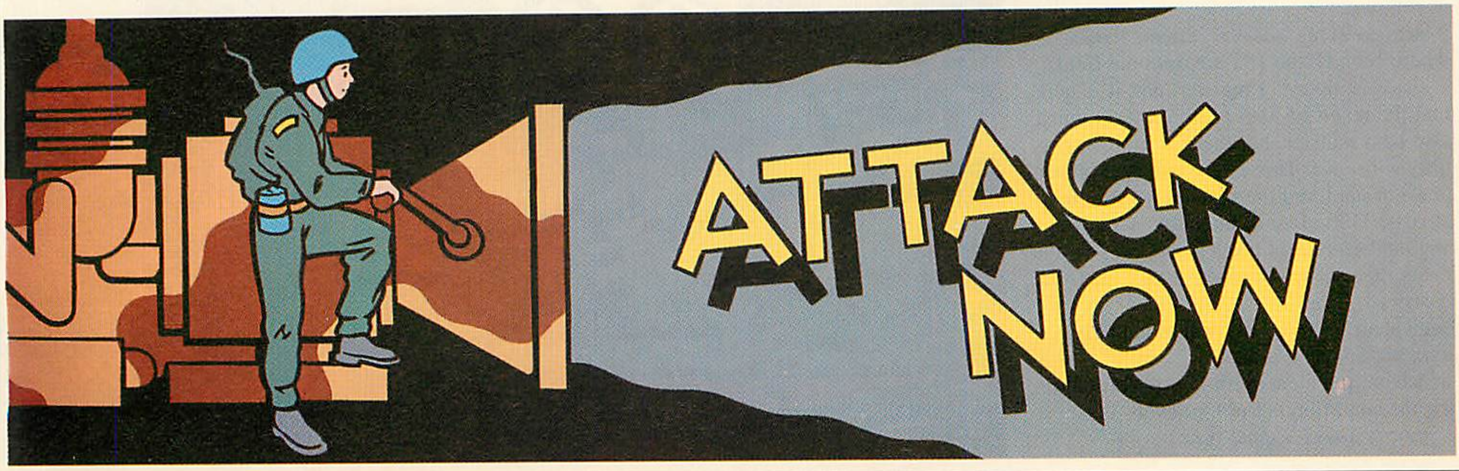
FNencrypt – breaks the original message up into groups, converts them to a numerical form using FNasc, encrypts this number by raising it to the power e, modulo N (using FNpow) and finally reconstructs an Ascii string using FNchr. This is then printed.

FNdecrypt – takes an encrypted ciphertext and performs the reverse operation to FNencrypt, using d instead of e for the power.

FNpow – raises a number to a power under a given modulo.

FNasc – converts a group of characters into a number. The parameter MOD determines whether all characters are allowed, or just the letters A-Z.

FNchr – the reverse operation to FNasc.



ADDED

Continuing his series on programming the Arm 2 Risc chip, **JASON O'BROIN** looks at how the data processing instruction classes actually operate

In the Archimedes built-in assembler there are 16 assembly language instructions – ranging from addition and subtraction to bit clearing and comparisons – which allow manipulation of the data in the registers. All the instructions in this group have a common structure and usage, so I will explain the ADD instruction in detail, and then the others. A full list of the data processing instructions is given opposite.

ADD instruction

Like all instructions, ADD consists of a number of fields which specify the registers, the instruction uses, the conditions in which to execute it and what effects it has.

This last option is powerful, since it allows the programmer to determine whether the status registers are updated to reflect the result of the operation. By default, these registers are not updated – but, by adding an S to the instruction mnemonic, they are.

The next instruction can depend upon the results of the ADD operation, saving the need to make a comparison.

Alternatively, the results can be passed through a number of operations unaltered – before being used as a test at the end of a loop, for example.

Performing some instructions without the S option is clearly illogical (the comparison instruction CMP is an obvious example) and, in this case, the assembler will automatically set the S flag.

ADD works with three registers (or two registers and a constant – two are operated on, and one is the result, or destination register. The instruction can be abbreviated as follows:

```
ADD{cond}{S} <dest>, <lhs>, <rhs>
```

where {cond} and {S} are optional fields.

<dest> is always a register, and it is here that the result of ADD is stored. <lhs> must also be a register, but there is more versatility with <rhs>. This can be either a register or a constant and the register's value may also be shifted or rotated by a constant amount before ADD takes place.

So, the instruction can now take the form

```
ADD r0,r1,r2
```

equivalent to r0=r1+r2, or alternatively

```
ADDNE r0,r1,#const
```

which is equivalent to r0=r1+const (assuming the condition is true), or even

```
ADDCCS r0,r1,r2 LSL #2
```

Any of the different shifting operations can be used, and indeed the value r2 can be shifted by the value stored in another register. Hence

```
ADDS r0,r1,r2 LSR r3
```

Note that the value stored in r2 is not altered, only the value used in the addition operation. The different data shifting operators were covered in the first article.

The fact that <rhs> can be a constant can cause problems, as ARM instructions occupy a four byte word, and only 12 bits are available for <rhs>. This only allows enough room for 2^12 (4096) distinct values, so the range of values const can hold are restricted. The problem is explained in detail in the box on Immediate Operands opposite.

There are no restrictions on what registers are used as <lhs>, <lhs> and <rhs>, so it is valid to do

```
ADD r0,r0,r0
```

which is the same as multiplying r0 by 2.

Indeed, combining this with a SHIFT operation allows easy number multiplication. If you wanted to multiply a number by 33, this can be achieved by shifting the number left five times (ie, multiplying by 32) and adding this result to the original number. This can be coded very simply:

```
ADD r0,r0,r0 LSL #5
```

As the data shifting happens in parallel with the instruction execution, this multiplication is achieved in one clock cycle, which is faster than the equivalent multiply instruction.

Most of the other instructions work in a



DATA PROCESSING INSTRUCTIONS

Instruction	Operation	Result
AND	Logical AND	<dest>=<lhs> AND <rhs>
EOR	Logical exclusive-OR	<dest>=<lhs> EOR <rhs>
SUB	Subtract	<dest>=<lhs> - <rhs>
RSB	Reverse subtract	<dest>=<rhs> - <lhs>
ADD	Addition	<dest>=<lhs> + <rhs>
ADC	Addition with carry	<dest>=<lhs> + <rhs> + <C>
SBC	Subtract with carry	<dest>=<lhs> - <rhs> - NOT <C>
RSC	Reverse subtract with carry	<dest>=<rhs> - <lhs> - NOT <C>
TST	Test bits	<status reg>=<lhs> AND <rhs>
TEQ	Test equivalence	<status reg>=<lhs> EOR <rhs>
CMP	Compare	<status reg>=<lhs> - <rhs>
CMN	Compare negative	<status reg>=<lhs> + <rhs>
ORR	Logical OR	<dest>=<lhs> OR <rhs>
MOV	Move value	<dest>=<rhs>
BIC	Clear specific bits	<dest>=<lhs> AND NOT <rhs>
MVN	Move negative value	<dest>=NOT <rhs>

where <C>=carry flag and <status reg>=Status register

similar manner to the one explained above, but there are some differences. In particular, the MOV instruction and the comparison operations warrant special attention.

The move instruction (MOV) is very simple. Basically, it moves the contents of one register into another. As a result it doesn't have a <lhs> operator. As usual, <rhs> can be an immediate constant as well. The MVN instruction works in a similar way, except that it negates the <rhs> before transferring it to <dest>. This is the simplest way of loading negative numbers, but note that

```
-n=NOT(n-1)
```

So, to produce the negative number, subtract one from the positive value. So, -64 would be produced using <rhs>=63.

Comparisons and bit testing

This subclass of instruction is odd because the operation produces no numerical result. These instructions set the status registers only. They compare <lhs> and <rhs> and don't require the S option to be set, as this will be set automatically by the assembler. Their operation is detailed above, but there are some special considerations when using r15, the program counter, which are common to all the instructions.

r15 can't be treated as an ordinary register partly because it contains the program counter as well as the value of the status registers. This means that the effects of an operation upon r15 depends on the position of r15 in the instruction.

So, if <lhs> is r15, only bit 2..25 is visible (this contains the value of the program counter, with the other bits being treated as zeros). If <rhs> is r15, then all the bits are clearly visible.

By comparison, if <dest> is r15, the outcome depends on whether the S option is set. Without the S flag, only the program counter bits are effected. If S is set, then the status registers which can be overwritten in the current processor mode will reflect the results of the operation.

Hence, if you want to set the negative flag (bit 31) you could use

```
ORRS r15,r15,#&80000000
```

There are some problems with the above instruction. The first is that because the <lhs> is r15, the status registers are seen as zero, and hence only the negative flag is set when written back (irrespective of the status registers' original values). The other problem is that the value of r15 the processor sees is always eight times greater than the address of the instruction itself due to the effect of the pipeline. The result is that the two instructions following the instruction will be missed.

This problem can be overcome as there is a special method of altering the value of the status bits. This involves the use of the comparison instructions, whereby the destination field is not used and is normally coded as being r0. Alternatively, if <dest> is coded as being r15, the status registers are updated from the result of the comparison operation (AND, EOR etc.), while the program counter remains the same. This can be done by attaching a P to the instruction.

So, to set the negative flag, without skipping the next two instructions, use

```
TEQP r15,#&80000000
```

Summary

This class of instructions is an important one, and provides the chief method of manipulating data in the registers. You can manipulate the value of the status registers with a little more effort, without an extra instruction to achieve this. When manipulating the program counter, take care due to the effect of pipelining, although this shouldn't really cause much of a problem.

Next month I will examine transferring data to and from memory.

IMMEDIATE OPERANDS

The value of <rhs> in a data processing instruction can be a constant. This can cause problems as only 12 bits of the four byte word the Arm instruction is stored in are allocated to <rhs>. This only provides enough room for 2^12 (4096) distinct values.

Rather than utilise these 12 bits in the obvious way, they are split up into two fields. The top four bits are called the position, while the bottom eight bits are called the value. The value can therefore represent 256 different combinations and the position determines where this value lies in the 32-bit word (there are only 16 values of the position, so the value is rotated by 2*position bits to the right). All remaining bits in the word are treated as being zero.

So, the constant 32768 (&8000) could have a value of &8000 and a position of 0, or a value of &80 and position of &F.

In practice, the assembler takes care of generating an appropriate 12-bit number if at all possible. If this is not possible, the assembler will generate an error whilst assembling. For example, a value of &1001 would generate an error.

There are other ways of using constants, but this involves loading the constant into a register, and will be dealt with in a future article.

VALUE

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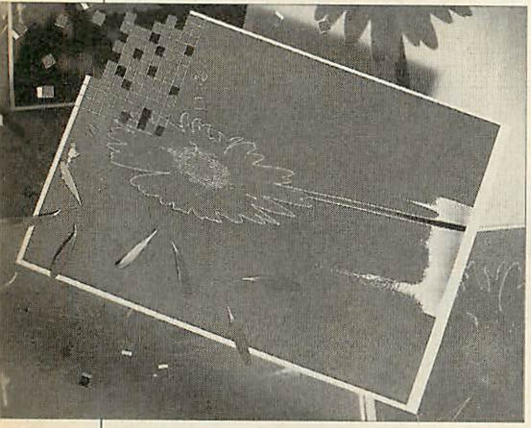
Other features

Upgradeable to Impression: Junior owners can upgrade to the full blown Impression for the difference in price, at any time • File compatible with Impression - documents saved with Impression Junior are directly loadable into other versions • Fully RISC OS compatible with direct links to !Draw, !Paint & other applications • Ideal for 1Mbyte machine owners • No hardware protection.

The manual includes a step-by-step introduction to Impression Junior. The tutorials take you, from scratch, through creating simple letters, multi-page documents and typical DTP type pages. The package also includes the highly acclaimed 'DTP at a glance' book.

If you have been overwhelmed by the capabilities of other DTP programs, or





LIGHT LINES

DAVID KNELL continues his series by explaining how to generate realistic images with ray-tracing techniques

Last month in *BBC Acorn User* we published a fairly advanced ray tracing program. However, for those of you new to this fascinating topic, here is a more basic description of the concepts behind creating ray traced images.

Ray tracing is a method of producing realistic computerised images by modelling true-to-life lighting effects.

The images we see are produced by light, emitted from various light sources (primarily the sun), being refracted and reflected by any objects in our field of vision. The rays entering our eyes are interpreted as 'real' objects.

Ray-tracing is an attempt to imitate this process using a computer. It doesn't work in exactly the same way as nature – the process is, in fact, reversed.

Rather than starting with a light source and tracing rays out from it in all directions to see what happens to them, rays are drawn from the observer through the computer screen to objects in the 'world' being drawn.

The brightness of the light hitting the object from light sources is then calculated by tracing rays back from the object to each light source and seeing what they pass through on the way.

The advantage of this method is that it requires a known number of rays to be traced to produce a picture (one for each pixel). The disadvantage is that it does not model nature exactly. In most cases this does not matter, but certain effects are difficult to obtain.

For instance, a refractive object can be used to model a magnifying glass looking at an object, but not concentrating rays from a light source.

In one case, there is only one ray, from the eye to the object; the other is an unknown quantity, so it is impossible to tell just how much light would be concentrated by a lens.

So, how are surfaces dealt with? How can they be made to appear textured, reflective, transparent, refractive, coloured, and so on?

Imagine the simple scene in figure 1: an observer, a light source and an illuminated sphere. In addition to the main light source, there is also 'ambient' lighting – a background level of light which hits every part of every object, regardless of whether light is shining directly onto it.

When you look at an object – say, a football – it is not only lit on the side nearest the primary light source (say, the sun) but it is also hit by reflected light from other nearby objects.

Rather than model this directly (which would be somewhat expensive in terms of CPU time), a level of background lighting is chosen to closely match reality.

Ambient light alone does not give a particularly realistic picture (see figure 2), so diffuse reflection – which reflects light from a light source – needs to be added. Diffuse reflection models reflection of light from dull surfaces.

To measure the reflection from a point on the surface of an object, a ray is drawn from that point to the light source. If it is unobstructed, then light from that source is falling on the object.

The amount of diffuse reflection is given by the intensity of the light from the source (which will reduce with distance), scaled by the cosine of the angle between the ray to the source and the normal to the object at that point (a line perpendicular to the object). This produces more acceptable results (see figure 3).

Diffuse reflection only allows for matt objects. For shiny ones (like snooker balls), 'specular highlights' are added to simulate reflection of light sources.

Phong devised a method of adding realistic highlight 'spots' to illuminated objects. The method calculates the angle between light source and the point on the object under consideration and calculates the difference between this and the angle needed to bounce light directly into the eye of the observer.

The cosine of this difference raised to a power (the 'Phong specular reflection coefficient') is used to determine the intensity of the highlight.

This coefficient is usually high (around 20-80) and so the intensity of highlight rapidly falls off as the difference between the angles increases.

Increasing it tightens the spot, giving the object a shinier appearance. Figures 4 and 5 show a pair of spheres with low and high Phong coefficients.

These methods enable realistic single objects to be produced, but making objects truly reflective (mirror-like) or transparent is more difficult.

For mirror-like images, reflected rays are traced from the object's surface and the illumination of the object is calculated. In effect, the ray-tracing operation is repeated, starting from the object hit in the direction the ray would take from the eye if reflected from the object's surface.

The colour of light coming back along this ray is added to the colour found from the previous illumination model at that point and the whole lot is sent back to the eye (see figure 6).

Transparent surfaces are dealt with by modelling the process of ray bending, known as refraction.

If you take a straight object (like the handle of a wooden spoon) and dip the end

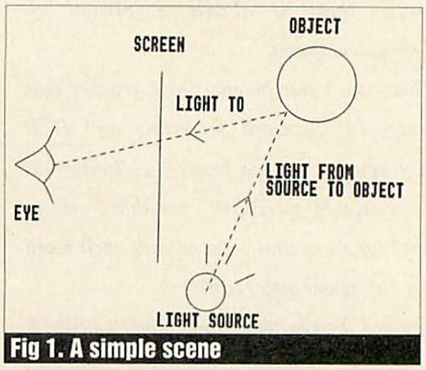


Fig 1. A simple scene

in the sink, it will appear to bend where it enters the water. This isn't caused by the object itself bending, but by the light rays themselves being bent on the way from water to air.

Generally, when a light ray passes from one medium to another, it bends. On passing from one medium to a denser one, it will be bent towards the normal to the surface where they meet, and vice versa.

The amount that the ray is bent is determined by the relative refractive indices of the two mediums (see figure 7).

This process can easily be modelled by a ray-tracer: provided it knows the relevant refractive indices, it can bend a light ray to imitate the process of refraction in nature. This technique be used to simulate magnifying glasses, glass tables or anything else that is transparent.

Of course, surfaces capable of transmitting light may be equally capable of reflecting it. Glass transmits, reflects and even shows specular highlights.

All three of these factors have to be calculated and the results must be added up for each point on a reflective, transmissive object. This results in two more rays being generated.

But there are possible problems. If a single ray can spawn two more, the result can be an infinite number of rays, thus causing problems with memory space and available processor power.

This can be prevented by eliminating rays whose contribution to the brightness of the object is less than a certain value (say five percent of the total).

Rays diminish in intensity with length (far-off objects look dimmer than close-by ones) and will also lose brightness at each reflection. So there is a guarantee that an infinite number of rays will not be the result and the scene can be ray-traced in a finite amount of time.

It does, however, take much longer to ray-trace scenes containing reflective and transmissive objects.

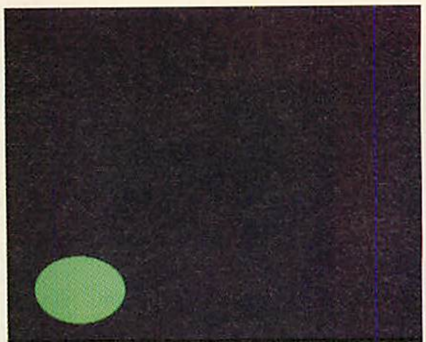
All that is needed now is some software to apply these surface modelling techniques to real objects. Available in the Archimedes marketplace are Clare's *Render Bender* and Steve Koren's *Quick Ray Tracer* (*QRT*).

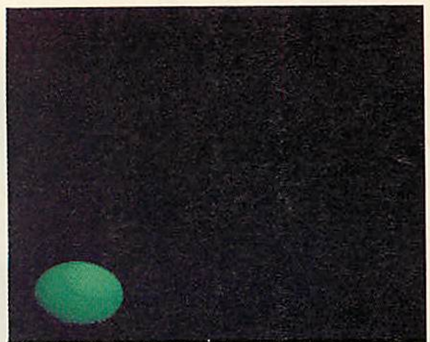
Both are good, with *Render Bender* offering more facilities (such as animation) but costing £79.95. *QRT*, on the other hand, is public domain.

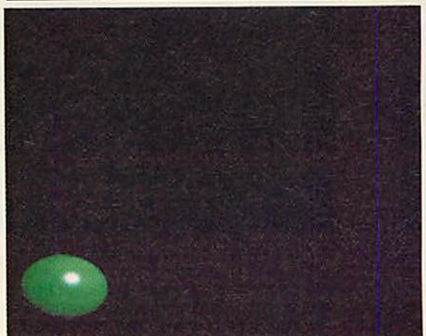
The final scene with this month's article shows what can be done using the techniques outlined above.

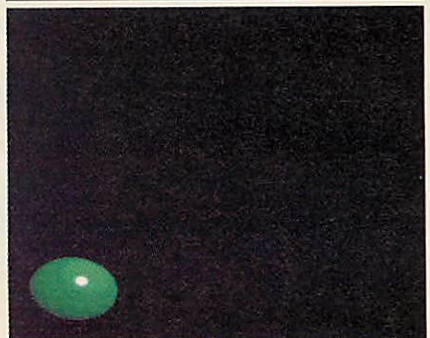
The picture is of a glass table and is taken from one of the example files that is supplied with *QRT*.

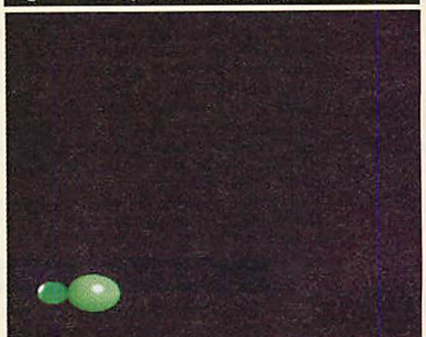
Next month we will be taking a closer look at the language of the public domain software, QRT.


Fig 2. A sphere seen in ambient light only


Fig 3. With diffuse reflection from light


Fig 4. With specular highlight


Fig 5. The same with Phong coeff. = 75


Fig 6. Reflection in a plate behind sphere

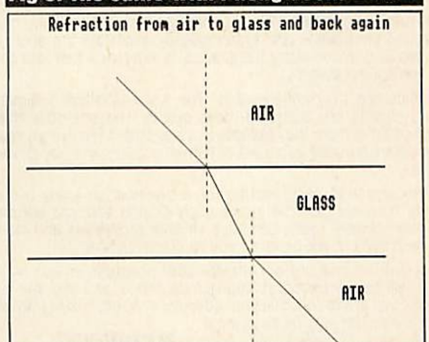
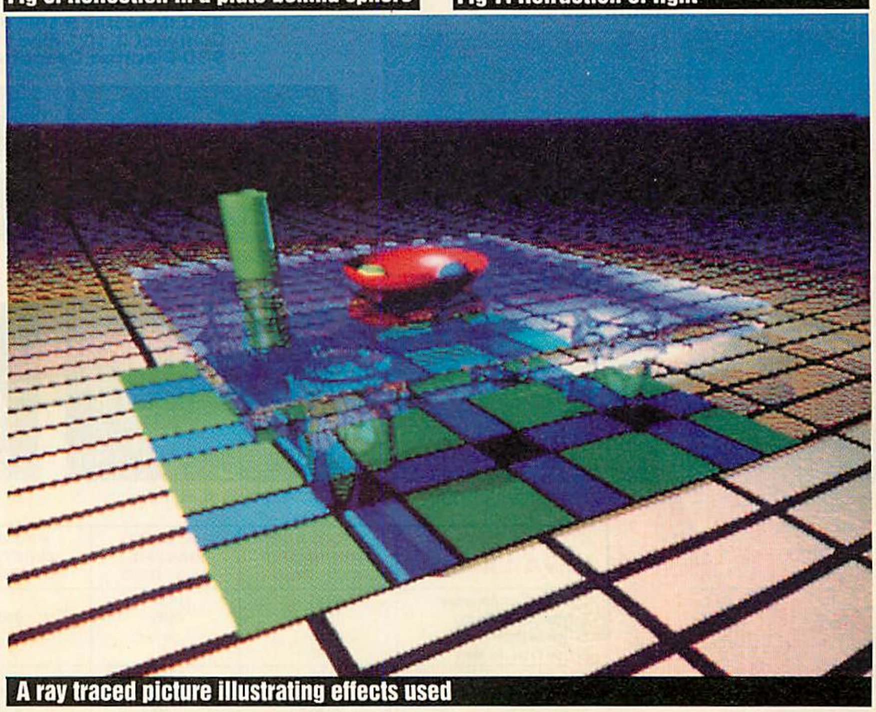
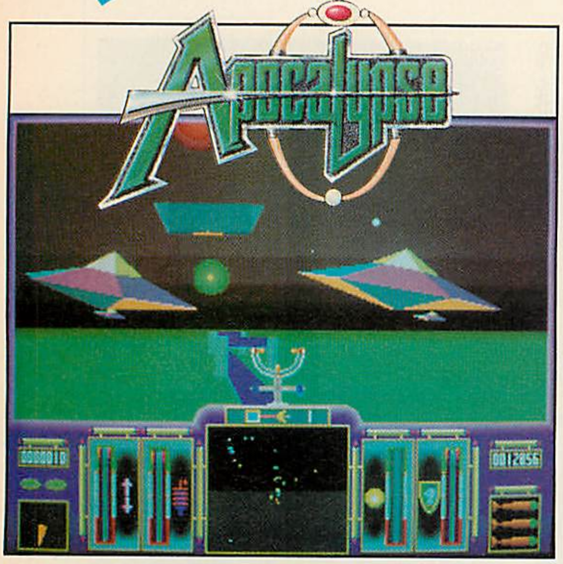


Fig 7. Refraction of light


A ray traced picture illustrating effects used

A3000
ARCHIMEDES
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THE 4TH



APOCALYPSE

Apocalypse is designed purely for the Archimedes. Utilising the machine's colossal processing power combined with ingenious programming techniques, the author has created a masterpiece which could not have been produced on any other home computer. The author is of course Gordon Key who already has Holed Out and E-Type under his belt. Apocalypse is by far his best work to date.

The game places you on the surfaces of varied futuristic hostile planets colonised by ruthless enemies. With your highly advanced craft you must find your way around the planets and systematically annihilate the enemy. Your ship, which can fly or move along the ground, is extremely fast and can even fight whilst hurtling backwards.

The graphics are truly unbelievable. The solid, shaded 3 dimensional buildings and objects are animated more quickly and smoothly than ever before. If you shoot at them they explode in a way that is terrifyingly real often catching fire before bursting into a ball of flames accompanied by devastating sound effects.

Initially Apocalypse is easy enough for a beginner to enjoy but as you progress your foes will become increasingly hostile and you will discover fascinating new objects. These can have strange properties and many may need to be destroyed. It will be up to you to discover how.

The Royal Guild of Spacing will monitor your progress as you play. Your performance will be assessed at appropriate times and you will need to impress them if you are to continue your adventure. Apocalypse is an amazing game. There's only one way to describe it....

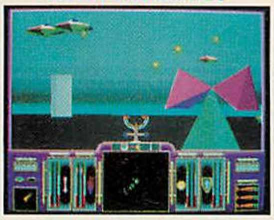
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PRICE: A3000/Archimedes £29.95


A3000/ARCHIMEDES


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INERTIA

Inertia is a totally original game with a huge landscape just waiting to be explored. It is available for the Archimedes, BBC Micro and Acorn Electron. Scattered (or rather fiendishly placed) around the landscape are many special tiles which need to be collected. Your highly sensitive craft floats freely around the landscape and you must exert forces upon it to guide its speed and direction.

You have a 3 dimensional viewpoint displaying a tiny fraction of the total playing area. There are walls, bridges, tunnels and ramps to negotiate and a host of mystery tiles with strange properties indeed. These include ice, jump and transformation tiles. There are even certain tiles which alternate the controls so that everything works in reverse.

This massive game has been very carefully put together and solving the puzzles within it will need lateral thought and a lot of dexterity.

The Archimedes version is considerably enhanced with digitised sound and music. It even features a full colour 3 dimensional map of the game which is a joy just to wander around. You'll certainly be amazed at the size of the game and the variety within it.

Inertia is a game for the determined. Each version makes full use of the ability of the computer so make sure you've got plenty of time to spare. Once you have started you won't be able to stop.

Electron User Golden Game May'90

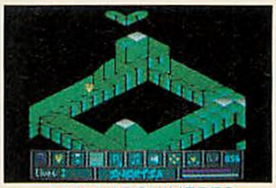
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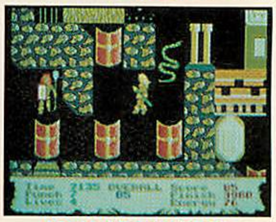
MAN-AT

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As you progress you will discover many intriguing objects which can behave very strangely. Many are documented such as wooden panels, hour glasses, thorns, portculli, mirrors etc.. But most are

PRICE: A3000/Ar


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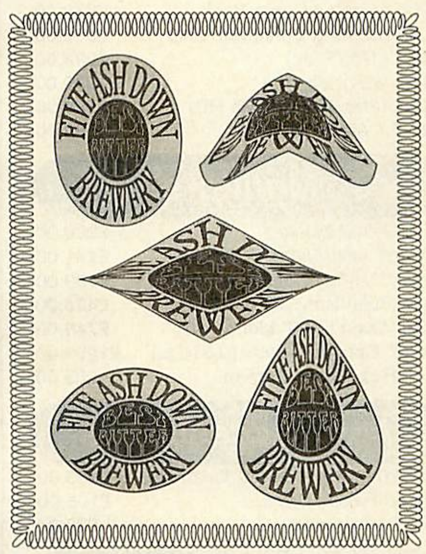
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PRINT IT BIG

If you want to stretch your screen images to wall size or simply print out party invitations, Poster is the package to use, as **PAUL JAMES** reports



If you are from the 'if you are going to draw something, draw it big' school of art, then the latest piece of software from 4Mation might be for you. Called *Poster*, it allows text and artwork – ranging from school art to fete publicity – created on the Arc to be reproduced to full poster size, using a standard printer.

Big in specification, this single page design software package is still reasonably priced at £89.

Applications

The *Poster* package enables single page design to be both educational and fun. Ask yourself what you really want from a package designed to produce notices – *Poster* more than likely has it.

All manner of things can be achieved, from printing text upside down, to running it around a circle. These and other 'tricks' are possible with what is a very well thought out package. *Poster* utilises all of the benefits of Risc OS and allows you to stretch your creative imagination to the limit.

Since 4Mation is an educational resource company, you might think that *Poster* is aimed specifically at the education market. But while both teachers and pupils will undoubtedly benefit from using *Poster*, it offers many other applications.

Businesses, clubs, societies and any individuals or organisations who need to produce large-scale visual material could benefit from using this package.

Poster is multi-tasking, behaving in much the same way as *!Draw*. It installs itself on the icon bar and when clicked on pops up a window showing a portion of the paper you are given to work on.

This piece of paper can be any size, from 1mm to 999in sq. You can choose from 10 user-defined sizes of your own including many other presets such as A0, A5 tabloid and pamplet. You don't have to worry about what your printer can cope with, as I will explain later.

Obviously, fonts play a large role in a page design package, they can enhance a poster in much the same way as music complements a film or TV show.

So 4Mation supplies, with the enhanced version, 20 fonts of varying quality and usefulness. All are outline fonts, so even a 3ft-high letter 'O' should remain smooth and clear.

Basic operations in *Poster* are much the same as those available from the *!Draw* select menu. *Poster* provides no line drawing facilities of its own, but Arc owners will already have *!Draw*.

Providing you have more than 1Mb of memory, the two complement each other perfectly, sitting on the icon bar. You can import from *!Draw* into *Poster* and from *Poster* into *!Draw*.

Each *!Draw* object saved into *Poster* appears as an object which can be selected. It can then be manipulated in exactly the same way although the implementation of these actions is much better than those in *!Draw* – for example, when you rotate an object with its rotate ear, the pointer changes to a little protractor with the number of degrees in it. Text areas from *!Edit* can also be loaded into *Poster*, allowing greater flexibilty and ease of use, thanks to onboard menus which help with the infamous un-user-friendliness of text header codes.

Poster uses the Risc OS printer drivers as standard, although on a 1Mb machine you may have to change to mode 0 before loading them.

If you drop a drawfile into *Poster* and scale it up to A0 size or larger, *Poster* automatically splits up this drawing into chunks that a printer can handle (generally A4), although this can be changed if you have a larger printer. Each sheet is printed with cut marks – all that's needed then are scissors, some sticky tape or glue and, depending on the size of the poster, a proportional amount of patience.

Although you can have enormous fun dropping drawfiles into *Poster* and enlarging them, the package really comes into its own when you use drawfiles in conjunction with its path text, moulding and border facilities.

Text options

Poster has three text options available – normal text, path text and mould text.

Normal text is exactly the same as text in *!Draw*, but much better implemented. Text can't be rotated, but it is quicker to plot and takes up less space.

For path text take a line from *!Draw*,

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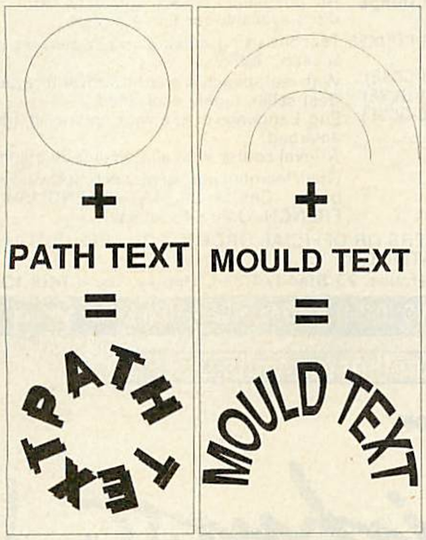
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save it into *Poster* and then you have a path for text to follow. This line can be straight or curved, or it can be a circle. 4Mation has supplied a directory of such lines, but I found the former method preferable.

To get your text to go along this line the 'Follow Path' option in the text menu must be ticked and the path selected. Now enter your text into the text box and your words are plotted along the path. To do this *Poster* takes the text you have entered and converts each letter into drawfile format, therefore each letter can be rotated to any degree, filled or be just an outline of any colour. The complete flexibilty of this option is mind boggling and it takes a few minutes of experimenting before its full potential is realised.

The 'Follow Path' option has a sub-menu, from which you can choose whether or not the text is left, right or centre justified on the path.

More useful is the 'adjust size to fit' option where the font size of the text is made so that the text occupies the entire path. Text can hang from the line like washing or sit on it, like Australian washing! It can also be reversed or placed upside down – only useful if you want to stick your poster on the front of your car!

The text can be slanted, ie, rotated on the path, alternatively the 'crazy option' can be ticked. This turns all of the letters through a random number of degrees, resulting in a rather strange, if not pleasing, look.

Shadows can be added to the text. Two types are catered for – a wall shadow is plotted behind the text, making it look as if it is raised off the paper and a floor shadow looks as if the text is standing up, casting its shadow. Both shadow effects are fully defineable – you can change the colour, depth and direction of both.

Combining all of the effects makes path text an interesting and flexible option, but nowhere near as interesting and flexible as...

Moulds

A mould is a set of two or four lines, in which you can place text or drawfiles. The two are handled by separate menus, but their operation is exactly the same. Plastic text is treated as a drawfile within *Poster*. Basically, you either draw your lines in *!Draw* and import them, or load them from the Moulds directory on the disc. If you want to mould text the 'Into Mould' selection is ticked from the text menu.

You then type text into the text box and press RETURN. *Poster* then squashes the words between and along these lines to produce some very nice effects. Moulding drawfiles is simply a matter of selecting a mould and the drawfile and clicking on Mould Object.

Mould is the most interesting part of *Poster*. It is difficult to extol its virtues in words – it is purely graphical! You will have to try it and see for yourself, but it is nice to see that something that is this much fun is useful as well!

Borders

What poster would be a poster without a border around it to make it stand out? Placing borders around objects is yet another very easy and well thought out facility of this excellent package. Simply select the objects you wish to place a border around and then get the border style box on the screen by pressing SHIFT f10.

Pressing the menu button over this style box brings up a list of defined borders, much like the font style box you are used to. You can also draw your own borders and place them in the special border directory, which will then make them available for selection as well.

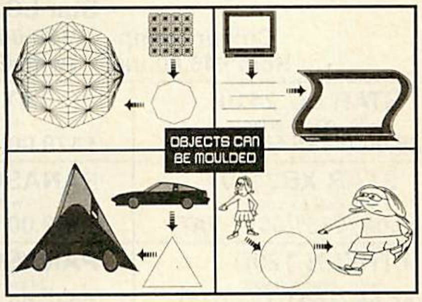
When you have selected your border it is shown in the style box. If you like it simply select 'Surround' and your choice of border is placed around the objects. Margins can be specified as can the thickness and magnification of the border.

Now comes the time for me to place my own border around this review.

Poster is really an excellent package. It conforms to all the rules laid down by Risc OS and runs happily alongside all applications and indeed enhances many of them, especially DTP packages. Don't let this make you think it can't stand up on its own, admittedly it really does need *!Draw* and possibly *!Edit* but it is a package cabable of producing anything from letterheads to full sized documents.

In the classroom it would provoke much thought and artistic license and could be used in any lesson from Art to Maths. However, I wouldn't like to see it plugged purely as an educational package.

It is not educational, it's merely so flexible it will inspire children and adults alike and should be looked upon as an educational tool. Teachers can use it to teach children anything.





You need a printer with *Poster*. Obviously a laser printer is preferable but thanks to Risc OS any printer is suitable. Also if you intend to use it seriously more than one megabyte of Ram is compulsory. It can run with just the single meg but that is like telling Van Gogh to paint with his ears!

The three discs, packaged together with an excellent manual and some very clear worksheets go together to make a package that makes me proud to own an Archimedes. *Poster* should be popular both at home and at school and 4Mation deserves the recognition it will almost certainly get from reviewers and users alike.

The basic Poster *package costs £74.75, an enhanced version with 18 extra fonts costs £102.35, from 4Mation, Linden Lea, Rock Park, Barnstaple, Devon EX32 9AQ.*



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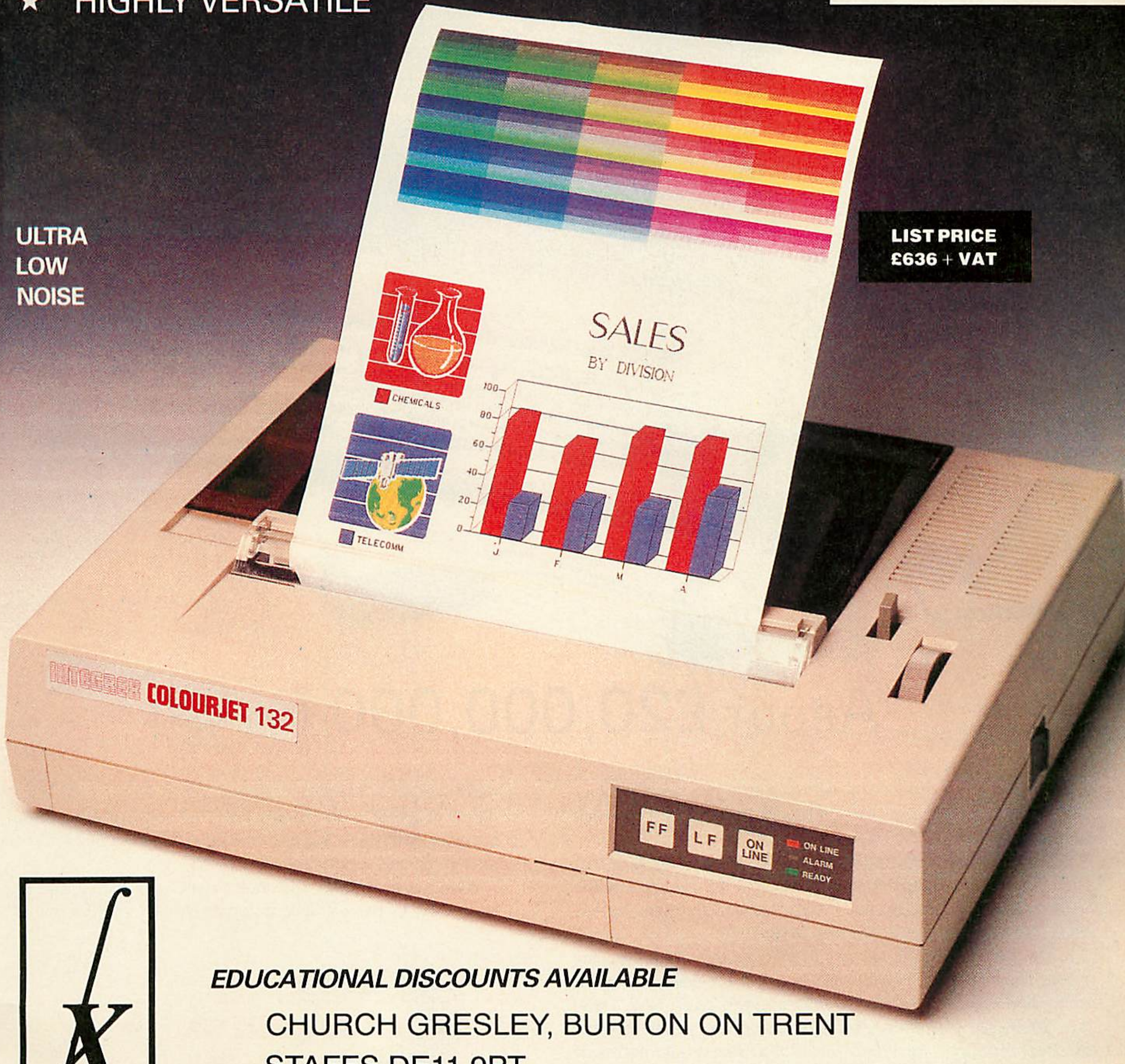
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Best to stick with flight simulation, we think. And with that in mind, allow us to introduce Interdictor 2. It is written by the same people who brought you Interdictor but it's bigger, better, smoother and (believe it or not) faster.

It has a more realistic aircraft model, an easy to fly training mode, a new navigation system allowing route planning, way point setting and mission pre-planning. Added to this is LOCSAC a new local Situational Awareness Computer that allows you to monitor the local situation. You'll fly over 10,000 square kilometres of trees, mountains, roads, rivers, railways, lakes and much, much more.

The main scenario contains nine sub scenarios of varying difficulty. There are more types of air and ground vehicles with more weapons. Enemy aircraft have more in-built intelligence and defence, and let's not forget one vital point; they're all out to get you. And there lies the real difference between a genuine jet fighter and Interdictor 2.

If you get shot down, with Interdictor 2, you simply start all over again. And, by the way, Interdictor 2 only costs **£34.95 (inc VAT).**

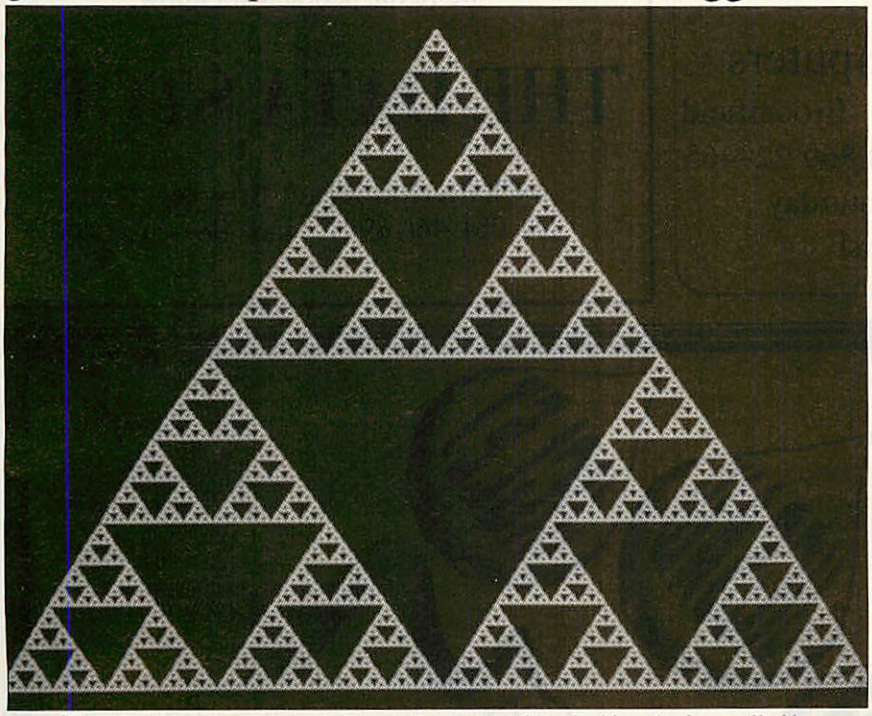
CLARES

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BLOWING A GASKET

Want to be driven crazy by playing with complex geometric shapes? **MAT TIZARD** has some suggestions



After watching an edition of a popular television science programme on the subject of fractals and chaos theory, I thought how easy it would be to transfer the ideas into computer algorithms.

Why? Because one of the fundamental ideas at the heart of fractal geometry is the construction of complex shapes from a few very simple rules.

Most of the ideas in the TV programme had been explored before, and more than a few had appeared in this magazine. But one item caught my eye. A man called Sierpinski conceived the idea of monstrous mathematical objects made by either adding or removing an infinite number of parts.

He had stumbled across a triangular tip of the chaos iceberg, which lurks beneath the ordered surface of everyday life, some considerable time before the chaos pioneers of the 1970s.

The triangle in question became known as the 'Sierpinski gasket', so called because of its fragmented appearance. The method outlined to get this elusive and beautiful shape to reveal itself was this.

Take three points (in this case on the screen), select one of them as your starting point, draw an imaginary line to one of the other points, but only plot the point halfway along this line. Then repeat this procedure, plotting the point which bisects a line drawn between the current position and any of the three corners.

You can imagine this obsessed mathematician doing his repetitive geometry with paper and pencil, and how long it took him to get results. But computers such as the Archimedes are ideal for manipulating such labour-intensive shapes.

A completely filled-in triangle is possible if you repeat this process a quarter of a million times (as the program does), but what emerges is a fractal triangle of such infinite and subtle complexity that it makes the brain wilt if you look at it too long.

It is possible to take this principle one stage further. If you draw several of these 'triangles' at different scales of magnification and then display them rapidly enough, an illusion of movement is created. The results of this really are breathtaking to anyone who appreciates the underlying inherent order of such shapes.

This is the purpose of listings 1 and 2 in the yellow pages, which are remarkably compact and take only a few minutes to type in. Take a blank ADFS or E format 3.5in disc and save the two programs as *Generate* and *Animate* respectively.

Then, using the desktop, assign at least 500K (25 frames of 20K each) to system sprites, via the Task Manager. Then run the *Generate* program, turn your monitor off, leave the disc in the drive, put a 'do not disturb' sign on the keyboard and let the computer do some serious thinking.

To generate all 25 frames, with 250,000 plots each, takes about seven hours, even on an Archimedes. Thus, it is ideal to set everything going just before you retire for the night, and you will be able to wake up, run *Animate* and be treated to a rather nice graphics display to start the day. The direction of magnification can be changed with the left and right cursor keys.

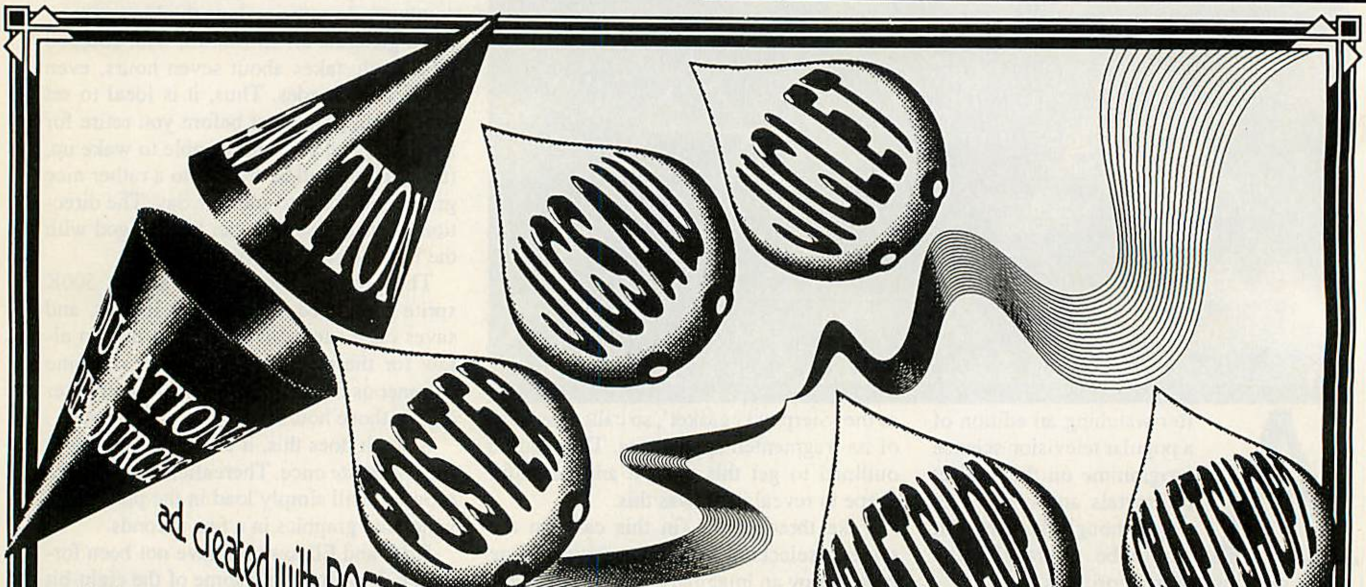
The program generates a single 500K sprite file called Triangles as it goes, and saves each successive frame to disc to allow for the common eventuality of some extraneous factor interrupting the computer during those hours – such as power loss.

Since it does this, it is only necessary to run *Generate* once. Thereafter, the *Animate* program will simply load in the previously generated graphics in a few seconds.

BBC and Elk owners have not been forgotten. Unfortunately some of the eight-bit machines don't have 500K to spare just for sprites, so listing 3 is a compromise which will generate a still frame of the gasket, but it will not animate it. Actually, it is easier to appreciate the structure if it isn't whizzing past at a rate of knots.

You might like to experiment with different vertices (corners) than I have used. As long as they are on the edges of the screen, the animation will still work. They are in a clearly visible data line at the end of *Generate* and are stored as three sets of x and y co-ordinates. Another interesting alteration is to change the actual number of vertices, which can produce some intriguing, but messy, results.

Enjoy the chaos.



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COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/ Turbo	ADFS	Econet	Shadow Ram	Monthly Disc
Risc Revue	30											
Listing 1-5							■		■	■	■	■
Eight Bits	57						■		■	■	■	■
Listing 1		■	■	■	■	■		■	■	■	■	■
Listing 2				■	■	■		■	■	■	■	■
Listing 3		■	■	■	■	■		■	■	■	■	■
Listing 4 (1)		■				■			■	■	■	■
Listing 5		■	■	■	■	■	■	■	■	■	■	■
Data Encryption	72	■	■	■	■	■	■	■	■	■	■	■
Fractual Triangles	89											
Listings 1-2							■		■	■	■	■
Listing 3		■	■	■	■	■	■	■	■	■	■	■

Note (1) requires Wordwise+

RISC REVUE

Listing 1

```
10 REM >Map (RR1)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU October 1990
50 :
60 MODE 13
70 OFF
80 DIM code% &1000,q% &100
90 dividend=0:divisor=1
100 result=2:sign=3
110 dtemp1=4:dtemp2=5:dtemp3=6
120 temp=0:temp2=1
130 write=2:width=3
140 columns=4:rows=5
150 count1=6:count2=7
160 stretchv=8:read=9
170 stretchh=10:flags=11
180 rowsize=12
190 sp=13:link=14:pc=15
198LOMEM END
200 FOR pass%=0 TO 2 STEP 2
210 P%=code%
220 [OPT pass%
230 .map
240 STMFD (sp)!,{link}
250 ADR R0,table
260 ADR R1,table+12
270 SWI "OS_ReadVduVariables"
280 LDR width,spritewidth
290 LDR rowsize,table+16
300 LDR temp,xpos1
310 LDR temp2,xpos0
320 SUBS columns,temp,temp2
330 MOVMI flags,#1
340 MOVPL flags,#0
350 RSBMI columns,columns,#0
360 LDR dividend,ypos2
370 LDR result,ypos0
380 SUB dividend,dividend,result
390 MOV dividend,dividend,ASL #16
400 MOV divisor,columns
410 BL divide
420 STR result,grad0
430 LDR dividend,ypos3
440 LDR result,ypos1
450 SUB dividend,dividend,result
460 MOV dividend,dividend,ASL #16
470 MOV divisor,columns
480 BL divide
490 STR result,grad1
500 MOV divisor,columns
510 MOV dividend,width,ASL #16
520 BL divide
530 STR result,hscale
540 MOV count1,#0
550 LDR temp,ypos0
560 MOV temp,temp,ASL #16
570 STR temp,ya
580 LDR temp,ypos1
590 MOV temp,temp,ASL #16
600 STR temp,yb
610 .columnloop
620 LDR temp,ya
630 LDR temp2,yb
640 SUB divisor,temp2,temp
650 MOV divisor,divisor,ASR #16
660 MOV count2,divisor
670 LDR dividend,spriteheight
680 MOV dividend,dividend,ASL #16
690 BL divide
700 MOV temp2,result
710 LDR write,table+12
720 TST flags,#%1
730 ADDEQ write,write,count1
740 SUBNE write,write,count1
750 LDR temp,xpos0
760 ADD write,write,temp
770 LDR temp,ya
780 MOV temp,temp,ASR #16
790 MLA write,temp,rowsize,write
800 MOV stretchv,#&10000
810 LDR temp,data
820 ADD read,temp,stretchh,ASR #16
830 .plotloop
840 SUBS count2,count2,#1
850 BMI doneplot
860 LDRB temp,[read]
870 STRB temp,[write],rowsize
880 SUBS stretchv,stretchv,temp2
890 BPL plotloop
900 .stretchit
910 ADD read,read,width
920 ADDS stretchv,stretchv,#&10000
930 BPL plotloop
940 B stretchit
950 .doneplot
960 LDR temp,hscale
970 ADD stretchh,stretchh,temp
980 LDR temp,ya
990 LDR temp2,grad0
1000 ADD temp,temp,temp2
1010 STR temp,ya
1020 LDR temp,yb
1030 LDR temp2,grad1
1040 ADD temp,temp,temp2
1050 STR temp,yb
1060 ADD count1,count1,#1
1070 CMP count1,columns
1080 BLT columnloop
1090 LDMFD (sp)!,{pc}
1100 :
1110 .table
1120 EQUD 148:EQUD 6:EQUD -1
1130 EQUD 0:EQUD 0
1140 :
1150 .divide
1160 STMFD (sp)!,{R3-R6,link}
1170 MOV result,#0
1180 EOR sign,dividend,divisor
1190 CMP divisor,#0
1200 RSBMI divisor,divisor,#0
1210 CMP dividend,#0
1220 RSBMI dividend,dividend,#0
1230 MOV dtemp2,#1
1240 MOV dtemp3,#31
1250 .divloop
1260 CMP divisor,dividend,ASR dtemp3
1270 ADDLE result,result,dtemp2,ASL dtemp3
1280 SUBLE dividend,dividend,divisor,ASL dtemp3
1290 SUBS dtemp3,dtemp3,#1
1300 BPL divloop
1310 CMP sign,#0
1320 RSBMI result,result,#0
1330 LDMFD (sp)!,{R3-R6,pc}
1340 :
1350 .spriteheight:EQUD 0
1360 .spritewidth:EQUD 0
1370 .vscale:EQUD 0
1380 .hscale:EQUD 0
1390 .xpos0:EQUD 0
1400 .ypos0:EQUD 0
1410 .xpos1:EQUD 0
```

Continued ▶

RISC REVUE

◀ Continued

```
1420 .ypos1:EQUD 0
1430 .ypos2:EQUD 0
1440 .ypos3:EQUD 0
1450 .grad0:EQUD 0
1460 .grad1:EQUD 0
1470 .ya:EQUD 0
1480 .yb:EQUD 0
1490 .data:EQUD 0
1500 ]
1510 NEXT pass%
1520 SYS "OS_File",5,"PaintDemo" TO exi
sts%,,,,slen%
1530 IF exists%<>1 THEN
1540 VDU 5
1550 DIM s% &10000
1560 !s%=&10000
1570 s%!4=0
1580 s%!8=16
1590 s%!12=16
1600 MOVE 0,32
1610 FOR i%=1 TO 10
1620 GCOL 15+41*(i% MOD 2)
1630 PRINT MID$("Risc Revue",i%,1);
1640 NEXT
1650 VDU 4
1660 OFF
1670 MOVE 0,0
1680 MOVE 319,32
1690 SYS "OS_SpriteOp",14+256,s%,"risco
s"
1700 ELSE
1710 DIM s% slen%+4
1720 !s%=slen%+4
1730 SYS "OS_File",255,"PaintDemo",s%+4
1740 ENDIF
1750 i%=0
1760 bank%=1
1770 SYS "OS_SpriteOp",40+256,s%,"risco
s" TO ,,,!spritewidth,!spriteheight
1780 SYS "OS_SpriteOp",24+256,s%,"risco
s" TO ,,a%
1790 !data=a%+a%!32
1800 REPEAT
1810 WAIT
1820 SYS "OS_Byte",112,bank%
1830 SYS "OS_Byte",113,3-bank%
1840 CLS
1850 z0=2200+800*SINRAD(i%)
1860 z1=2200+800*SINRAD(i%+120)
1870 !xpos0=160+100*COSRAD(i%)*z0/2200
1880 !xpos1=160+100*COSRAD(i%+120)*z1/2
200
1890 !ypos0=128-32*z0/2200
1900 !ypos2=128-32*z1/2200
1910 !ypos1=128+32*z0/2200
1920 !ypos3=128+32*z1/2200
1930 CALL map
1940 i%=(i%+8) MOD 360
1950 bank%=3-bank%
1960 UNTIL INKEY(0)>-1
1970 SYS "OS_Byte",112,bank%
1980 END
```

Listing 2

```
10 REM >Factorial (RR2)
20 REM by A Reysenbach
30 REM for Archimedes only
40 REM (c) BAU October 1990
50 :
60 MODE 0
70 @%=1
80 len=1
90 INPUT"Enter number (1-10000): "F%
100 IF F%>1 AND F%<10000 THEN
110 FOR Q%=2 TO F%
120 len+=LOG(Q%)
130 NEXT
140 DIM T%(len)
150 PROCfac
160 ENDIF
170 END
180 :
190 DEF PROCfac
200 T%(1)=1
210 C%=0
220 digits=1
230 FOR A%=2 TO F%
240 digits+=LOG(A%)
250 FOR B%=1 TO digits
260 S%=T%(B%)*A%+C%
270 T%(B%)=S% MOD 10
280 C%=S% DIV 10
290 NEXT B%
300 NEXT A%:CLS
310 PRINT STR$(F%);"! = ":PRINT
320 FOR D%=len TO 1 STEP -1
330 PRINT T%(D%);
340 NEXT D%
350 PRINT''"which is approx. ";T%(len)
;" x 10^";INT(len)-1
360 ENDPROC
```

Listing 3

```
10 REM >ShowSort (RR3)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU October 1990
50 :
60 MODE 15
70 OFF
80 DIM q% 16,code% 8
90 P%=code%
100 [OPT 0
110 CMP R1,R0
120 MOV R15,R14
130 ]
140 !q%=148
150 q%!4=-1
160 SYS "OS_ReadVduVariables",q%,q%+8
170 b%=q%!8
180 FOR i%=b% TO b%+&28000-1 STEP 4
190 j%=RND(128)-1
200 !i%=j% OR (j%<<8) OR (j%<<16) OR (
j%<<24)
210 NEXT
220 REPEAT
230 SYS "OS_HeapSort",&A000,b%,0
240 SYS "OS_HeapSort",&A000,b%,code%
250 UNTIL FALSE
260 END
270 T%(B%)=S% MOD 10
280 C%=S% DIV 10
290 NEXT B%
300 NEXT A%:CLS
310 PRINT STR$(F%);"! = ":PRINT
320 FOR D%=len TO 1 STEP -1
330 PRINT T%(D%);
340 NEXT D%
350 PRINT''"which is approx. ";T%(len)
;" x 10^";INT(len)-1
360 ENDPROC
```

Listing 4

```
10 REM >3Dplot (RR4)
20 REM by James Gallagher
30 REM for Archimedes only
40 REM (c) BAU October 1990
50 :
60 MODE 0
70 OFF
80 a=7
90 b=1.5
100 s%=80
110 disc%=TRUE
120 rad=2
130 yo%=512
140 ORIGIN 640,yo%
150 t=2*rad/s%
160 DIM y(s%+1)
170 FOR x=-rad TO 0 STEP rad/320
180 xx=x*x
190 z=rad
200 FOR i%=1 TO s%+1
210 r=SQR(xx+z*z)
220 IF r>rad AND disc% THEN
230 y(i%)=99
240 ELSE
250 y(i%)=EXP(-r*r)*COS(3*PI*r)
260 c=(a*y(i%)-b*z)/(a-z)
270 m=(y(i%)-c)/z
280 j%=i%-1
290 z0=z+t
300 v%=SGN(m*z0+c-y(j%))
310 hid%=FALSE
320 WHILE NOT hid% AND j%>0 AND y(j%)<
>99
330 hid%=SGN(v%*(m*z0+c-y(j%)))
340 j%-=1
350 z0+=t
360 ENDWHILE
370 IF NOT hid% POINT 640*x/rad,512*c:
POINT -638*x/rad,512*c
380 ENDIF
390 z-=t
400 NEXT
410 NEXT
420 END
```

Listing 5

```
10 REM >ChangedBox (RR5)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU October 1990
50 :
60 MODE 15
70 OFF
80 spriteop%=&2E
90 DIM sp% &20000
100 !sp%=&20000
110 sp%!4=0
120 sp%!8=16
130 sp%!12=16
140 SYS spriteop%,15+256,sp%,"screen",
0,640,200,15
150 SYS spriteop%,62 TO ,,,needed%
160 DIM pres% needed%
170 x=640
180 y=512
190 dx=16
200 dy=8
210 on%=FALSE
220 c%=0
230 PRINT"ChangedBox detection: "''
240 PRINT"(Press SPACE to toggle)"
250 REPEAT
260 !pres%=0
270 SYS spriteop%,61+256,sp%,"screen",
pres% TO r0%,r1%,r2%,r3%
280 SYS "OS_ChangedBox",2
```

Continued ▶

RISC REVUE

◀ Continued

```
290 SYS "OS_ChangedBox",1
300 x+=dx
310 IF x<50 OR x>1230 dx=-dx
320 y+=dy
330 IF y<50 OR y>750 dy=-dy
340 GCOL c%
350 CIRCLE FILL x,y,100
360 c%=(c%+8) AND &7F
370 SYS "OS_ChangedBox",-1 TO ,info%
380 x0%=2*info%!4
390 y0%=4*info%!8
400 x1%=2*info%!12
410 y1%=4*info%!16
420 SYS spriteop%,r0%,r1%,r2%,r3%
430 IF on% THEN
440 VDU 24,x0%;y0%;x1%;y1%;
450 SYS spriteop%,34+256,sp%,"screen"
460 ELSE
470 VDU 26
480 SYS spriteop%,34+256,sp%,"screen"
490 ENDIF
500 PRINTTAB(22,0);
510 IF on% PRINT"ON " ELSE PRINT"OFF"
520 IF INKEY(0)=32 on%=NOT on%
530 UNTIL FALSE
540 END
```

EIGHT BITS

Listing 1

```
10 REM New Modes 3 and 6
20 REM by Michael Brown
30 REM for B/B+/E/M/C
40 REM (c) BAU Oct 90
50 :
60 forcol%=0
70 bakcol%=6
80 :
90 start=&0C00
100 osbyte=&FFF4
110 oswrch=&FFEE
120 wrchv=&020E
130 wrch=(!wrchv AND &0000FFFF)
140 modeflag=start+&80
150 temp=start+&81
160 :
170 FOR pass%=0 TO 2 STEP 2
180 P%=start
190 [OPT pass%
200 :
210 PHA
220 TXA
230 PHA
240 TYA
250 PHA
260 TSX
270 LDA &0103,X
280 STA temp
290 CMP #&16
300 BNE testflag
310 LDA #&DA
320 LDX #&00
330 LDY #&FF
340 JSR osbyte
350 TXA
360 BNE out
370 INC modeflag
380 BNE out
390 :
400 .testflag
410 LDA modeflag
420 BEQ out
430 LDA temp
440 CMP #&03
450 BEQ invvideo
460 CMP #&06
470 BEQ invvideo
480 LDA #&00
490 STA modeflag
500 BEQ out
510 :
520 .invvideo
530 JSR wrch
540 :
550 LDA #&00
560 STA modeflag
570 LDX #&00
580 :
590 .loop1
600 LDA vdudata,X
610 JSR oswrch
620 INX
630 CPX #&0C
640 BNE loop1
650 LDX #&00
660 :
670 .loop2
680 LDA crtcdata,X
690 STA &FE00
700 LDA crtcdata+1,X
710 STA &FE01
720 INX
730 INX
740 CPX #&06
750 BNE loop2
760 LDA #&00
770 STA modeflag
780 :
790 .out
800 PLA
810 TAY
820 PLA
830 TAX
840 PLA
850 JMP wrch
860 :
870 .vdudata
880 EQUW &0013
890 EQUD (&00000000+bakcol%)
900 EQUW &0113
910 EQUD (&00000000+forcol%)
920 :
930 .crtcdata
940 EQUW &0709
950 EQUW &2604
960 EQUW &1F07
970 ]
980 NEXT pass%
990 ?modeflag=&00
1000 ?wrchv=start MOD 256
1010 ?(wrchv+1)=start DIV 256
1020 END
```

Listing 2

```
10 REM One-Liner
20 REM by Paul de Sa
30 REM for M/C/A
40 REM (c) BAU Oct 90
50 :
60 MODE4:VDU19,0,1;0;:FORX=0TO1250STEP50:FORY=0TO1000STEP50:IFRND(2)=1MOVEX,Y+50:MOVEX,Y+25:PLOT165,X+25,Y+50:MOVEX+50,Y:MOVEX+50,Y+25:PLOT165,X+25,Y:NEXT:NEXTELSEMOVEX,Y:MOVEX+25,Y:PLOT165,X,Y+25:MOVEX+50,Y+50:MOVEX+25,Y+50:PLOT165,X+50,Y+25:NEXT:NEXT
```

Listing 3

```
10 REM Cassette Inlay Card Printer
20 REM by Graham Campbell
30 REM for BBC B/B+/E/M/C
40 REM (c) BAU Oct 90
50 :
60 MODE 128
70 ON ERROR PROCerror
80 PROCsetup
90 PROCdisplay(1)
100 PROCwarning
110 PROCoutput
120 PROCgo_again
130 END
140 :
150 DEF PROCsetup
160 *FX214 1
170 *FX213,171
180 *FX212,200
190 DIM trackA$(12),trackB$(12),ann$(20),L$(14)
200 AA%=FALSE:BB%=FALSE
210 READ title$
220 FOR Y%=1 TO 14
230 READ ann$(Y%)
240 NEXT
250 PROCblue
260 PROCbox
270 PROCtitle
280 PRINT TAB(5,15)ann$(11);
290 k%=GET
300 IF INKEY(-69) OR INKEY(-7) PROCload:ENDPROC
310 VDU26,12
320 PROCbox
330 PROCtitle
340 PROCtab(ann$(1))
350 PRINTTAB(t%,4)ann$(1)
360 PROCtab(ann$(2))
370 PRINTTAB(t%,5)ann$(2)
380 PROCtab(ann$(3))
390 PRINTTAB(t%,7)ann$(3)
400 PROCtab(ann$(4))
410 PRINTTAB(t%,8)ann$(4)
420 PROCtab(ann$(5))
430 PRINTTAB(t%,10)ann$(5)
440 PROCtab(ann$(6))
450 PRINTTAB(t%,12)ann$(6)
460 PROCinput
470 ENDPROC
480 :
490 DEF PROCwarning
500 PROCred
510 PROCcoff
520 PROCbox
530 PRINTTAB(22,15) "MAKE SURE THE PRINTER IS SET UP"
540 PRINTTAB(29,18) "AND PRESS ANY KEY "
550 k%=GET
560 CLS
570 PROCblue
580 ENDPROC
590 DEFPROCdisplay(b%)
600 VDU26,12,28,5,30,79,3
610 PROCprint
```

Continued ▶

EIGHT BITS

◀ Continued

```
620 PROCcon
630 VDU7
640 PRINT'"Do you want to save this to a diskfile?  Y or N : ";
650 k%=GET
660 IF INKEY(-69) OR INKEY(-7) PROCsave:VDU28,5,30,79,3:PROCprint
670 PROCcheck
680 IF b%=2 ENDPROC
690 VDU7
700 INPUT'"HOW MANY COPIES DO YOU WANT PRINTING?   :  "how_many%
710 VDU26,12
720 ENDPROC
730 :
740 DEF PROCtoo_long
750 VDU7
760 PRINTTAB(23)"TOO LONG-USE ONLY 31 CHARACTERS"'
770 ENDPROC
780 DEFPROCsave
790 CLS
800 PROCcon
810 PROCred
820 PRINTTAB(0,12)"Give a file name to this information ";
830 PRINT"and press << RETURN >>"
840 INPUT'''"F i l e n a m e  :  "f$
850 PROCcoff
860 out%=OPENOUT(f$)
870 PRINT#out%,titleA$,titleB$,artistA$,artistB$
880 FOR A%=1 TO 12
890 PRINT#out%,trackA$(A%),trackB$(A%)
900 NEXT
910 CLOSE#out%
920 CLS
930 ENDPROC
940 :
950 DEF PROCload
960 CLS
970 PROCcon
980 *CAT
990 PRINT'''"    Type the filename containing the information ";
1000 PRINT "and press << RETURN >>"
1010 INPUT'''"     F i l e n a m e   :  "file$
1020 PROCcoff
1030 CLS
1040 PROCtitle
1050 PRINTTAB(15,15)"Just loading << ";file$;" >>"
1060 in%=OPENIN(file$)
1070 INPUT#in%,titleA$,titleB$,artistA$,artistB$
1080 FOR A%=1 TO 12
1090 INPUT#in%,trackA$(A%),trackB$(A%)
1100 NEXT
1110 CLOSE#in%
1120 ENDPROC
1130 :
1140 DEF PROCred
1150 VDU19,0,1,0,0,0
1160 ENDPROC
1170 :
1180 DEF PROCblue
1190 VDU19,0,4,0,0,0
1200 ENDPROC
1210 :
1220 DEF PROCcon
1230 VDU23,1,1;0;0;0;
1240 ENDPROC
1250 DEFPROCcoff
1260 VDU23,1,0;0;0;0;
1270 ENDPROC
1280 :
1290 DEF PROCbox
1300 DRAW0,1023
1310 DRAW1279,1023
1320 DRAW1279,0
1330 DRAW0,0
1340 ENDPROC
1350 :
1360 DEF PROCflush
1370 VDU2,1,&1B,1,&40,3
1380 ENDPROC
1390 :
1400 DEF PROCtab(z$)
1410 t%=((79-LENz$)/2)
1420 ENDPROC
1430 :
1440 DEF PROCerror
1450 IF ERR=222 CLS:PRINTTAB(5,15)"No such file! ";:W%=INKEY(200):RUN
1460 VDU3,26,12
1470 REPORT
1480 PRINT" at line ";ERL
1490 PROCcon
1500 END
1510 ENDPROC
1520 :
1530 DEF PROCoutput
1540 FOR P%=1 TO how_many%
1550 VDU2
1560 PROCprint
1570 IF P%<>how_many% CLS:PRINTTAB(8,15)ann$(10):k%=GET:CLS
1580 NEXT
1590 PROCflush
1600 ENDPROC
1610 :
1620 DEF PROCprint
1630 PROCcoff
1640 PROCred
1650 VDU1,27,1,64
1660 VDU1,27,1,69
1670 VDU1,27,1,15
1680 PRINT STRING$(69,"-")
1690 PRINTTAB(0)"| ";titleA$ TAB(36) titleB$ TAB(68)"|"
1700 PRINTTAB(0)"| ";artistA$ TAB(36) artistB$ TAB(68)"|"
1710 PRINTTAB(0)"| " TAB(68)"|"
1720 FOR A%=1 TO 12
1730 PRINTTAB(0)"| "trackA$(A%);TAB(36);trackB$(A%);TAB(68)"|"
1740 NEXT
1750 PRINT STRING$(69,"-")
1760 PRINTTAB(0)"| ";titleA$;"   ";artistA$ TAB(68)"|"
1770 PRINTTAB(0)"| ";titleB$;"   ";artistB$ TAB(68)"|"
1780 PRINT STRING$(69,"-")
1790 FOR A%=1 TO 3
1800 PRINT TAB(0)"|"TAB(68)"|"
1810 NEXT
1820 PRINT "|";STRING$(67,"-");"|"
1830 VDU3
1840 PROCblue
1850 ENDPROC
1860 :
1870 DEF PROCgo_again
1880 VDU26,12
1890 PROCbox
1900 PROCcoff
1910 PROCtab(ann$(7))
1920 PRINTTAB(t%,15)ann$(7)
1930 PROCtab(ann$(8))
1940 PRINTTAB(t%,18)ann$(8)
1950 PROCtab(ann$(9))
1960 PRINTTAB(t%,20)ann$(9)
1970 IF GET=32 THEN RUN ELSE PROCcon:CLS:END
1980 :
1990 DEF PROCtitle
2000 PROCtab(title$)
2010 PRINTTAB(t%,1)title$
2020 PRINTTAB(t%,2)STRING$(LEN(title$),"~")
2030 ENDPROC
2040 :
2050 DEF PROCinput
2060 VDU28,10,30,63,14
2070 INPUTLINE'''"SIDE A: Album Title  :  "titleA$
2080 IF LEN(titleA$)>31 THEN PROCtoo_long:GOTO2070
2090 INPUTLINE"  Group/Band/Artist  :  "artistA$
2100 IF LEN(artistA$)>31 THEN PROCtoo_long:GOTO2090
2110 PRINT
2120 FOR A%=1 TO 12
2130 IF A%<10 PRINT"          Track  ";A%;"  :  ";:INPUTLINE""trackA$(A%)
2140 IF A%>9  PRINT"          Track ";A%;"  :  ";:INPUTLINE""trackA$(A%)
2150 IF LEN(trackA$(A%))>31 THEN PROCtoo_long:GOTO2130
2160 NEXT
2170 VDU7,12
2180 INPUTLINE '''"SIDE B: Album Title  :  "titleB$
2190 IF LEN(titleB$)>31 THEN PROCtoo_long:GOTO2180
2200 INPUTLINE "  Group/Band/Artist  :  "artistB$
2210 IF LEN(artistB$)>31 THEN PROCtoo_long:GOTO2200
2220 PRINT
2230 FOR B%=1 TO 12
2240 IF B%<10 PRINT"          Track  ";B%;"  :  ";:INPUTLINE""trackB$(B%)
2250 IF B%>9  PRINT"          Track ";B%;"  :  ";:INPUTLINE""trackB$(B%)
2260 IF LEN(trackB$(B%))>31 THEN PROCtoo_long:GOTO2240
2270 NEXT
2280 ENDPROC
2290 :
2300 DEF PROCcheck
2310 VDU7,13:PROCcoff:PRINT"IF THIS IS OK FOR PRINTING PRESS <SPACE>";
2320 PRINT" - IF NOT, PRESS ANY OTHER KEY"
2330 IF GET<>32 THEN PROCdblecheck
2340 PROCcon:ENDPROC
2350 :
2360 DEF PROCdblecheck
2370 CLS
2380 PROCcon
2390 PRINTTAB(5,13)ann$(12)
2400 PRINTTAB(5,15)ann$(13)
2410 PRINTTAB(5,17)ann$(14)
2420 PRINTTAB(5,21)"C h o i c e  :  ";
2430 k%=GET
2440 IF INKEY(-66) OR INKEY(-27) CLS:PROCgo_again
2450 IF INKEY(-51) OR INKEY(-28) PROCdisplay(2)
2460 IF INKEY(-35) OR INKEY(-27) PROCedit:PROCdisplay(2)
2470 ENDPROC
2480 :
2490 DEF PROCedit
```

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```
2500 CLS
2510 PRINTTAB(5,15)"Do you want to edit
 side  A  or side  B   :   ";
2520 k%=GET
2530 IF INKEY(-66)OR INKEY(-31)CLS:AA%=
TRUE:PROCeditA
2540 IF INKEY(-101)OR INKEY(-30)CLS:BB%
=TRUE:PROCeditB
2550 INPUTTAB(1,19)"Which line number t
o re-type?  :  "num%
2560 INPUTLINETAB(1,R%)"Line now to rea
d : "temp$
2570 IF LEN(temp$)>31 PROCtoo_long:R%=2
7:GOTO2560
2580 l$(num%)=temp$
2590 IFAA%titleA$=l$(1):artistA$=l$(2):
FORY%=1TO12:trackA$(Y%)=l$(Y%+2):NEXT
2600 IFBB%titleB$=l$(1):artistB$=l$(2):
FORY%=1TO12:trackB$(Y%)=l$(Y%+2):NEXT
2610 CLS
2620 AA%=FALSE
2630 BB%=FALSE
2640 ENDPROC
2650 :
2660 DEF PROCeditA
2670 l$(1)=titleA$
2680 l$(2)=artistA$
2690 PRINTTAB(1,1)"1";TAB(6)titleA$
2700 PRINTTAB(1,2)"2";TAB(6)artistA$
2710 FOR Y%=1TO12
2720 l$(Y%+2)=trackA$(Y%)
2730 PRINTTAB(1,Y%+4);Y%+2;TAB(6)trackA
$(Y%)
2740 NEXT
2750 ENDPROC
2760 :
2770 DEF PROCeditB
2780 l$(1)=titleB$
2790 l$(2)=artistB$
2800 PRINTTAB(1,1)"1";TAB(6)titleB$
2810 PRINTTAB(1,2)"2";TAB(6)artistB$
2820 FOR Y%=1TO12
2830 l$(Y%+2)=trackB$(Y%)
2840 PRINTTAB(1,Y%+4);Y%+2;TAB(6)trackB
$(Y%)
2850 NEXT
2860 ENDPROC
2870 :
2880 DATA Printed Cassette-Insert Progr
am  - by Graham Campbell
2890 DATA This Program will create a pr
inted cassette inlay sheet for you
2900 DATA for printing on any Dot Matri
x printer supporting compressed print.
2910 DATA "In addition to the TITLE and
 ARTISTS, you can get details of TWO"
2920 DATA albums on each insert : one o
n Side A and one on Side B
2930 DATA There's room to insert 12 tra
cks from each album.
2940 DATA "For a 'nil return' on any en
try, just press <<RETURN>>"
2950 DATA Thanks for using my services!
2960 DATA To go again press < S P A C E
 >
2970 DATA To quit the program press any
 other key
2980 DATA Press any key if the paper su
pply is OK for the next copy
2990 DATA "Is the track-information hel
d on file?   Y  or  N   :   "
3000 DATA Press  E  to enter  EDIT  mod
e
3010 DATA Press  A  to  A B O R T
3020 DATA Press  D  to display label ag
ain
```

Listing 4

```
10 REM Wordwise Memory Extension
20 REM by Alan Hodge
30 REM for B/E with Wordwise/WW+
40 REM (c) BAU Oct 90
50 :
60 MODE4
70 printposl=&D8
80 printposh=&D9
90 textx=&318
100 texty=&319
110 scrollposl=&350
120 scrollposh=&351
130 alt_chars=&13
140 charptl=&E0
150 charpth=&E1
160 temp=&DA
170 FOR pass=0 TO 3 STEP3
180 P%=&1600-13
190 [
200 .invert_data
210 OPT pass
220 EQUD &00000000
230 EQUD &00001301
240 EQUD &13000600
250 :
260 EQUB &00
270 EQUD &00000000
280 EQUD &071F0000
290 EQUD &00001700
300 EQUD &00000000
310 EQUD &00042600
320 EQUD &00000017
330 EQUD &00000000
340 EQUD &17000907
350 :
360 .setup
370 LDA #begin MOD 256
380 STA &20E
390 LDA #begin DIV 256
400 STA &20F
410 LDA #0
420 STA info
430 RTS
440 :
450 .begin
460 PHP
470 PHA
480 STA temp
490 TXA
500 PHA
510 TYA
520 PHA
530 LDA&355
540 CMP old_mode
550 BEQ start
560 STA old_mode
570 JSR new_mode
580 :
590 .start
600 LDA info
610 AND #1
620 BEQ def_rout
630 LDA info
640 AND #&FE
650 STA info
660 :
670 JSR copy_yn
680 BNE chg_mode
690 LDY #6
700 :
710 .copy
720 LDA temp
730 CMP #7
740 BEQ chg_mode
750 LDA info
760 ORA #2
770 STA info
780 LDA temp
790 CMP #7+128
800 BNE not_seven
810 TYA
820 JMP not_seven+2-(temp>&FF)
830 .not_seven
840 LDA temp
850 JSR &E0A4
860 LDA #7
870 JSR &E0A4
880 JMP call_new_mode
890 :
900 .chg_mode
910 JSR &E0A4
920 LDA info
930 AND #&FD
940 STA info
950 :
960 .call_new_mode
970 JSR new_mode
980 JMP return
990 :
1000 .new_mode
1010 LDX #11
1020 LDA &356
1030 AND #1
1040 CMP #1
1050 BNE invert
1060 LDX #11+33
1070 :
1080 .invert
1090 LDA invert_data,X
1100 JSR &E0A4
1110 DEX
1120 BPL invert
1130 RTS
1140 :
1150 .def_rout
1160 LDA info
1170 AND #4
1180 BEQ rout
1190 LDA info
1200 AND #&FB
1210 STA info
1220 JMP ctrl_c
1230 :
1240 .rout
1250 LDA temp
1260 CMP #1
1270 BNE mode
1280 LDA info
1290 ORA #4
1300 STA info
1310 :
1320 .goto_ctrl_c
1330 JMP ctrl_c
1340 :
1350 .mode
1360 CMP #22
1370 BNE notmode
1380 LDA info
1390 AND #&FD
1400 STA info
1410 JSR copy_yn
1420 BNE notmode
1430 LDA info
1440 ORA #1
1450 STA info
1460 JMP ctrl_c
1470 :
```

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EIGHT BITS

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```
1480 .notmode
1490 LDA info
1500 AND #2
1510 BNE not_one
1520 JMP ctrl_c
1530 :
1540 .not_one
1550 LDA temp
1560 CMP #13
1570 BNE is_it_lf
1580 INC texty
1590 JSR newline
1600 JSR calcss
1610 JMP end
1620 :
1630 .is_it_lf
1640 CMP #10
1650 BNE other
1660 JMP end
1670 :
1680 .other
1690 SBC #32
1700 BCC goto_ctrl_c
1710 :
1720 .not_ctrl_c
1730 STA charptl
1740 LDA #0
1750 LDY #2
1760 STA charpth
1770 :
1780 .savemem
1790 ASL charpth
1800 ASL charptl
1810 LDA charpth
1820 ADC #0
1830 STA charpth
1840 DEY
1850 BPL savemem
1860 :
1870 .dd
1880 CLC
1890 LDA charpth
1900 ADC #alt_chars
1910 STA charpth
1920 LDY #0
1930 LDA printposl
1940 ASL A
1950 ASL A
1960 ASL A
1970 ASL A
1980 ASL A
1990 BNE not_normal
2000 :
2010 .normal
2020 LDA (charptl),Y
2030 STA (printposl),Y
2040 INY
2050 CPY #8
2060 BNE normal
2070 CLC
2080 LDA printposl
2090 ADC #4
2100 STA printposl
2110 LDA printposh
2120 ADC #0
2130 STA printposh
2140 JMP noteol
2150 :
2160 .not_normal
2170 SEC
2180 LDA printposl
2190 SBC #4
2200 STA printposl
2210 :
2220 .not_norm
2230 LDA (charptl),Y
2240 LSR A
2250 LSR A
2260 LSR A
2270 LSR A
2280 ORA (printposl),Y
2290 STA (printposl),Y
2300 INY
2310 CPY #8
2320 BNE not_norm
2330 CLC
2340 LDA printposl
2350 ADC #8
2360 STA printposl
2370 LDA printposh
2380 ADC #0
2390 STA printposh
2400 CMP#&80
2410 BNE notendofscr
2420 LDA &34E
2430 STA printposh
2440 :
2450 .notendofscr
2460 INC textx
2470 LDA &30A
2480 CMP textx
2490 BCS noteol
2500 :
2510 .not_dd
2520 INC texty
2530 JSR newline
2540 :
2550 .noteol
2560 :
2570 .end
2580 LDA &D0
2590 AND #1
2600 BNE to_printer
2610 :
2620 .return
2630 PLA
2640 TAY
2650 PLA
2660 TAX
2670 PLA
2680 PLP
2690 RTS
2700 :
2710 .to_printer
2720 LDA #1
2730 JSR &E0A4
2740 :
2750 .ctrl_c
2760 PLA
2770 TAY
2780 PLA
2790 TAX
2800 PLA
2810 PLP
2820 JMP &E0A4
2830 :
2840 .copy_yn
2850 LDX #&96
2860 :
2870 .scan
2880 LDA #&81
2890 LDY #&FF
2900 JSR &FFF4
2910 CPX #&FF
2920 RTS
2930 :
2940 .newline
2950 LDA #0
2960 STA textx
2970 :
2980 .hold
2990 LDX #&FE
3000 JSR scan
3010 BNE line
3020 JSR scan
3030 BNE line
3040 BEQ hold
3050 :
3060 .line
3070 LDA texty
3080 AND #&7F
3090 STA temp
3100 LDA &309
3110 CMP temp
3120 BCS notnl
3130 LDA texty
3140 AND #&80
3150 STA texty
3160 BMI notnl
3170 LDA #0
3180 STA scrollposl
3190 LDA &34E
3200 LSR A
3210 LSR A
3220 LSR A
3230 STA scrollposh
3240 LDA #&80
3250 ORA texty
3260 STA texty
3270 :
3280 .notnl
3290 LDA texty
3300 BMI init_offset
3310 LDA #0
3320 STA off_l
3330 STA off_h
3340 BEQ no_off_update
3350 :
3360 .init_offset
3370 LDA texty
3380 AND #&7F
3390 BNE no_off_update
3400 LDA &355
3410 CMP #3
3420 BEQ mode_three_six
3430 CMP #6
3440 BEQ mode_three_six
3450 BNE no_off_update
3460 :
3470 .mode_three_six
3480 AND #1
3490 TAX
3500 :
3510 .three_six_add
3520 CLC
3530 LDA off_l
3540 ADC #&40
3550 STA off_l
3560 LDA off_h
3570 ADC #&1F
3580 STA off_h
3590 DEX
3600 BPL three_six_add
3610 :
3620 CMP&354
3630 BCC no_off_update
3640 SBC &354
3650 STA off_h
3660 :
3670 .no_off_update
3680 LDA texty
3690 BPL rts
3700 :
3710 .cont
3720 JSR calcss
3730 LDX &30A
3740 INX
3750 TXA
3760 LSR A
3770 LSR A
3780 LSR A
3790 TAX
3800 DEX
3810 :
3820 .ocloop
3830 LDY #63
3840 LDA #0
3850 :
3860 .icloop
3870 STA (printposl),Y
3880 DEY
3890 BPL icloop
3900 CLC
3910 LDA printposl
3920 ADC #64
3930 STA printposl
3940 LDA printposh
3950 ADC #0
3960 STA printposh
3970 CMP #&80
3980 BNE endclear
3990 LDA &34E
4000 STA printposh
4010 LDA #0
4020 STA printposl
4030 :
4040 .endclear
4050 DEX
4060 BPL ocloop
4070 JSR calcss
4080 LDY &30A
4090 INY
4100 TYA
4110 CLC
4120 ADC scrollposl
4130 STA scrollposl
4140 LDA scrollposh
4150 ADC #0
4160 STA scrollposh
4170 CMP #&10
4180 BNE vduss
4190 :
4200 .wrap
4210 LDA scrollposh
4220 ASL A
4230 ASL A
4240 ASL A
4250 SEC
4260 SBC &354
4270 LSR A
4280 LSR A
4290 LSR A
4300 STA scrollposh
4310 :
4320 .vduss
4330 LDA #12
4340 STA &FE00
4350 LDA scrollposh
4360 STA &FE01
4370 LDA #13
4380 STA &FE00
4390 LDA scrollposl
4400 STA &FE01
4410 :
4420 .rts
4430 RTS
```

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EIGHT BITS

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```
4440 :
4450 .calcss
4460 LDA texty
4470 AND #&7F
4480 ASL A
4490 TAY
4500 LDA &C375,Y
4510 STA printposh
4520 INY
4530 LDA &C375,Y
4540 STA printposl
4550 :
4560 LDX &355
4570 CPX #4
4580 BCC highmode
4590 LSR printposl
4600 LSR printposh
4610 :
4620 .highmode
4630 LDA #Ø
4640 ROR A
4650 ORA printposl
4660 STA printposl
4670 CLC
4680 LDA printposh
4690 ADC &34E
4700 STA printposh
4710 :
4720 CLC
4730 LDA printposl
4740 ADC off_l
4750 STA printposl
4760 LDA printposh
4770 ADC off_h
4780 STA printposh
4790 CMP #&8Ø
4800 BCC skip_omode
4810 LDA printposh
4820 SBC &354
4830 STA printposh
4840 :
4850 .skip_omode
4860 RTS
4870 .info
4880 EQUB &BB
4890 .off_l
4900 EQUB &BB
4910 .off_h
4920 EQUB &BB
4930 .old_mode
4940 EQUB &BB
4950 ]
4960 NEXT
4970 :
4980 S%=&13ØØ
4990 FOR X%=32 TO 126
5000 READ I%
5010 FOR D%=1 TO 8
5020 READ I%
5030 ?S%=I%
5040 S%=S%+1
5050 NEXT D%
5060 NEXT X%
5070 DATA 32,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
5080 DATA 33,32,32,32,32,32,Ø,32,Ø
5090 DATA 34,8Ø,8Ø,8Ø,Ø,Ø,Ø,Ø,Ø
5100 DATA 35,8Ø,112,8Ø,8Ø,112,8Ø,8Ø,Ø
5110 DATA 36,48,96,96,32,48,48,96,Ø
5120 DATA 37,64,8Ø,16,32,64,8Ø,16,Ø
5130 DATA 38,32,8Ø,8Ø,32,8Ø,8Ø,48,Ø
5140 DATA 39,16,32,64,Ø,Ø,Ø,Ø,Ø
5150 DATA 4Ø,16,32,64,64,64,32,16,Ø
5160 DATA 41,64,32,16,16,16,32,64,Ø
5170 DATA 42,Ø,32,112,32,112,32,Ø,Ø
5180 DATA 43,Ø,32,32,112,32,32,Ø,Ø
5190 DATA 44,Ø,Ø,Ø,48,48,32,64,Ø
5200 DATA 45,Ø,Ø,Ø,112,Ø,Ø,Ø,Ø
5210 DATA 46,Ø,Ø,Ø,Ø,Ø,96,96,Ø
5220 DATA 47,Ø,16,16,32,32,64,64,Ø
5230 DATA 48,32,8Ø,8Ø,8Ø,8Ø,8Ø,32,Ø
5240 DATA 49,32,96,32,32,32,32,112,Ø
5250 DATA 5Ø,112,16,16,112,64,64,112,Ø
5260 DATA 51,112,16,16,112,16,16,112,Ø
5270 DATA 52,8Ø,8Ø,8Ø,112,16,16,16,Ø
5280 DATA 53,112,64,64,112,16,16,112,Ø
5290 DATA 54,112,64,64,112,8Ø,8Ø,112,Ø
5300 DATA 55,112,16,16,16,16,16,16,Ø
5310 DATA 56,112,8Ø,8Ø,112,8Ø,8Ø,112,Ø
5320 DATA 57,112,8Ø,8Ø,112,16,16,112,Ø
5330 DATA 58,Ø,96,96,Ø,96,96.Ø,Ø
5340 DATA 59,Ø,48,48,Ø,48,48,96,Ø
5350 DATA 6Ø,Ø,16,32,64,32,16,Ø,Ø
5360 DATA 61,Ø,Ø,112,Ø,112,Ø,Ø,Ø
5370 DATA 62,Ø,64,32,16,32,64,Ø,Ø
5380 DATA 63,32,8Ø,8Ø,16,32,Ø,32,Ø
5390 DATA 64,48,8Ø,8Ø,112,112,64,48,Ø
5400 DATA 65,32,8Ø,8Ø,112,8Ø,8Ø,8Ø,Ø
5410 DATA 66,96,8Ø,8Ø,96,8Ø,8Ø,96,Ø
5420 DATA 67,48,64,64,64,64,64,48,Ø
5430 DATA 68,96,8Ø,8Ø,8Ø,8Ø,8Ø,96,Ø
5440 DATA 69,112,64,64,112,64,64,112,Ø
5450 DATA 7Ø,112,64,64,112,64,64,64,Ø
5460 DATA 71,48,64,64,8Ø,8Ø,8Ø,48,Ø
5470 DATA 72,8Ø,8Ø,8Ø,112,8Ø,8Ø,8Ø,Ø
5480 DATA 73,112,32,32,32,32,32,112,Ø
5490 DATA 74,112,32,32,32,32,32,96,Ø
5500 DATA 75,8Ø,8Ø,8Ø,96,96,8Ø,8Ø,Ø
5510 DATA 76,64,64,64,64,64,64,112,Ø
5520 DATA 77,8Ø,112,8Ø,8Ø,8Ø,8Ø,8Ø,Ø
5530 DATA 78,8Ø,112,112,112,8Ø,8Ø,8Ø,Ø
5540 DATA 79,112,8Ø,8Ø,8Ø,8Ø,8Ø,112,Ø
5550 DATA 8Ø,112,8Ø,8Ø,112,64,64,64,Ø
5560 DATA 81,112,8Ø,8Ø,8Ø,8Ø,112,112,Ø
5570 DATA 82,96,8Ø,8Ø,96,8Ø,8Ø,8Ø,Ø
5580 DATA 83,48,64,64,112,16,16,96,Ø
5590 DATA 84,112,32,32,32,32,32,32,Ø
5600 DATA 85,8Ø,8Ø,8Ø,8Ø,8Ø,8Ø,112,Ø
5610 DATA 86,8Ø,8Ø,8Ø,8Ø,8Ø,32,32,Ø
5620 DATA 87,8Ø,8Ø,8Ø,8Ø,112,112,8Ø,Ø
5630 DATA 88,8Ø,8Ø,8Ø,32,8Ø,8Ø,8Ø,Ø
5640 DATA 89,8Ø,8Ø,8Ø,112,32,32,32,Ø
5650 DATA 9Ø,112,16,16,32,64,64,112,Ø
5660 DATA 91,112,64,64,64,64,64,112,Ø
5670 DATA 92,64,64,32,32,32,16,16,Ø
5680 DATA 93,112,16,16,16,16,16,112,Ø
5690 DATA 94,32,32,8Ø,8Ø,Ø,Ø,Ø,Ø
5700 DATA 95,Ø,Ø,Ø,Ø,Ø,Ø,112,Ø
5710 DATA 96,32,8Ø,64,112,64,64,112,Ø
5720 DATA 97,Ø,Ø,112,16,112,8Ø,112,Ø
5730 DATA 98,64,64,64,112,8Ø,8Ø,112,Ø
5740 DATA 99,Ø,Ø,48,64,64,64,48,Ø
5750 DATA 1ØØ,16,16,16,112,8Ø,8Ø,112,Ø
5760 DATA 1Ø1,Ø,Ø,112,8Ø,112,64,112,Ø
5770 DATA 1Ø2,16,32,32,112,32,32,32,Ø
5780 DATA 1Ø3,Ø,Ø,112,8Ø,8Ø,112,16,112
5790 DATA 1Ø4,Ø,64,64,112,8Ø,8Ø,8Ø,Ø
5800 DATA 1Ø5,32,Ø,96,32,32,32,112,Ø
5810 DATA 1Ø6,32,Ø,32,32,32,32,64,Ø
5820 DATA 1Ø7,Ø,64,8Ø,8Ø,96,8Ø,8Ø,Ø
5830 DATA 1Ø8,96,32,32,32,32,32,112,Ø
5840 DATA 1Ø9,Ø,Ø,8Ø,112,112,8Ø,8Ø,Ø
5850 DATA 11Ø,Ø,Ø,64,112,8Ø,8Ø,8Ø,Ø
5860 DATA 111,Ø,Ø,112,8Ø,8Ø,8Ø,112,Ø
5870 DATA 112,Ø,Ø,112,8Ø,8Ø,112,64,64
5880 DATA 113,Ø,Ø,112,8Ø,8Ø,112,16,16
5890 DATA 114,Ø,Ø,96,8Ø,64,64,64,Ø
5900 DATA 115,Ø,Ø,48,64,112,16,96,Ø
5910 DATA 116,32,32,112,32,32,32,48,Ø
5920 DATA 117,Ø,Ø,8Ø,8Ø,8Ø,8Ø,112,Ø
5930 DATA 118,Ø,Ø,8Ø,8Ø,8Ø,32,32,Ø
5940 DATA 119,Ø,Ø,8Ø,8Ø,112,112,8Ø,Ø
5950 DATA 12Ø,Ø,Ø,8Ø,8Ø,32,8Ø,8Ø,Ø
5960 DATA 121,Ø,Ø,8Ø,8Ø,8Ø,112,16,112
5970 DATA 122,Ø,Ø,112,16,32,64,112,Ø
5980 DATA 123,16,32,96,64,96,32,16,Ø
5990 DATA 124,96,96,96,Ø,96,96,96,Ø
6000 DATA 125,64,32,48,16,48,32,64,Ø
6010 DATA 126,32,32,8Ø,Ø,Ø,Ø,Ø,Ø
6020 *SAVE WWMEMEX 13ØØ 19ØØ 162Ø
```

Listing 5

```
   1Ø REM Svenska Print
   2Ø REM by J W Brooks
   3Ø REM for BBC B/B+/E/M/C/A
   4Ø REM (c) BAU Oct 9Ø
   5Ø :
   6Ø PRINT "SWEDISH CHARACTER CONVERTER
"
   7Ø PRINT"If this program does not wor
k, try"
   8Ø PRINT"setting PAGE=&";~PAGE+&5ØØ"
and CHAINing"
   9Ø PRINT"the program again."
  1ØØ *FX2Ø,6
  11Ø *FX2Ø,5
  12Ø VDU 23  91 36  Ø  6Ø 1Ø2 126 1Ø2 1
Ø2 Ø
  13Ø VDU 23 124 36  Ø  6Ø 1Ø2 1Ø2 1Ø2
6Ø Ø
  14Ø VDU 23  93 24  Ø  6Ø 1Ø2 126 1Ø2 1
Ø2 Ø
  15Ø VDU 23 123 36  Ø  6Ø   6  62 1Ø2
62 Ø
  16Ø VDU 23 125 24  Ø  6Ø   6  62 1Ø2
62 Ø
  17Ø VDU 23  92 36 6Ø 1Ø2 1Ø2 1Ø2 1Ø2
6Ø Ø
  18Ø VDU 2 1 27 1 ASC"R" 1 5 3
  19Ø PRINT"Characters redefined "
  2ØØ PRINT"[ ] { } \ |"
```

ENCRYPTION

```
   1Ø REM >PKE - A demonstration of Publ
ic Key Encryption
   2Ø REM By Dave Lawrence
   3Ø REM For BBC B/B+/M/C/E/A
   4Ø REM (c) BAU October 199Ø
   5Ø :
   6Ø MODE Ø
   7Ø PROCinit
   8Ø PROCpqnde
   9Ø PRINT"Original message : "'message
$'
  1ØØ ciphertext$=FNencrypt(message$,e,N
)
  11Ø PRINT"Cipher text : "'ciphertext$'
  12Ø decoded$=FNdecrypt(ciphertext$,d,N
)
  13Ø PRINT"Decoded message : "'decoded$
'
  14Ø END
  15Ø :
  16Ø DEF PROCinit
  17Ø chars$="ABCDEFGHIJKLMNOPQRSTUVWXYZ
."
  18Ø all=LEN(chars$)
```

Continued ▶

ENCRYPTION

◀ Continued

```
190 onlyAZ=INSTR(chars$,"Z")
200 block=2
210 message$="A VERY SIMPLE DEMONSTRAT
ION OF PUBLIC KEY ENCRYPTION."
220 ENDPROC
230 :
240 DEF PROCpqnde
250 REPEAT
260 p=FNprime
270 q=FNprime
280 N=p*q
290 prod=RND(5)*(p-1)*(q-1)+1
300 d=INT(SQR(prod))+1
310 REPEAT
320 d=d-1
330 UNTIL (prod MOD d)=0 OR d=1
340 UNTIL d<>1
350 e=prod DIV d
360 PRINT"Values chosen:"
370 PRINT"p = ";p
380 PRINT"q = ";q
390 PRINT"e = ";e'
400 PRINT"N = ";N;" (p * q)"
410 PRINT"d = ";d;" (calculated)"'
420 ENDPROC
430 :
440 DEF FNprime
450 REPEAT
460 num=RND(100)*2+31
470 index=3
480 flag=TRUE
490 sqr=SQR(num)
500 REPEAT
510 IF (num MOD index)=0 flag=FALSE
520 index = index + 2
530 UNTIL index>sqr OR flag=FALSE
540 UNTIL flag=TRUE
550 =num
560 :
570 DEF FNencrypt(str$,e,N)
580 ans$=""
590 REPEAT
600 sub$=LEFT$(str$ + "     ",block)
610 orig=FNasc(sub$,all)
620 code=FNpow(orig,e,N)
630 ans$=ans$ + FNchr(code,onlyAZ) + "
"
640 str$=MID$(str$,block+1)
650 UNTIL str$ = ""
660 =ans$
670 :
680 DEF FNdecrypt(str$,d,N)
690 ans$=""
700 REPEAT
710 size= INSTR(str$," ")
720 sub$=LEFT$(str$,size-1)
730 code=FNasc(sub$,onlyAZ)
740 orig=FNpow(code,d,N)
750 ans$=ans$+FNchr(orig,all)
760 str$=MID$(str$,size+1)
770 UNTIL str$=""
780 =ans$
790 :
800 DEF FNpow(number,power,modulus)
810 max=INT(LN(power)/LN(2))
820 ans=number
830 REPEAT
840 max=max - 1
850 ans=(ans*ans) MOD modulus
860 IF power AND (2^max) THEN ans=(ans
*number) MOD modulus
870 UNTIL max=0
880 =ans
890 :
900 DEF FNasc(a$,mod)
910 ans=0
920 FOR I%=1 TO LENa$
930 ans=ans*mod+INSTR(chars$,MID$(a$,I
%,1))-1
940 NEXT
950 =ans
960 :
970 DEF FNchr(a,mod)
980 chr$=""
990 REPEAT
1000 chr$=MID$(chars$,a MOD mod+1,1)+ch
r$
1010 a=a DIV mod
1020 UNTIL a=0 AND LENchr$>=block
1030 =chr$
```

FRACTAL TRIANGLES

Listing 1

```
10 REM >Fractal Triangles 1
20 REM Frame generator
30 REM by Mat Tizard
40 REM for Archimedes only
50 REM (c) BAU October 1990
60 :
70 MODE0:OFF
80 *SNEW
90 FRAME=0:X=0:Y=0:CO%=0
100 DIM X(3),Y(3)
110 FOR N=1 TO 3
120 READ X(N),Y(N)
130 NEXT N
140 FOR SCALE=1 TO 2 STEP 0.04
150 FRAME+=1
160 REPEAT
170 R=RND(3)
180 PROCplot(X,Y,X(R),Y(R),SCALE)
190 UNTIL CO%=250000
200 MOVE0,0:MOVE1279,1023
210 OSCLI"SGET "+STR$(FRAME)
220 *SSAVE TRIANGLES
230 CLS
240 CO%=0
250 NEXT SCALE
260 END
270 :
280 DEF PROCplot(C,E,F,G,S)
290 LOCAL x,y,L
300 x=(F-C):y=(G-E)
310 L=SQR((C-F)^2+(E-G)^2)
320 IF L=0 THEN ENDPROC
330 X=C+(L/2)*x/L
340 Y=E+(L/2)*y/L
350 POINT X*S,Y*S
360 CO%+=1
370 ENDPROC
380 :
390 REM Vertices-
400 DATA 1280,0,640,1024,0,0
```

Listing 2

```
10 REM >Fractal Triangles 2
20 REM Animator
30 REM by Mat Tizard
40 REM for Archimedes only
50 REM (c) BAU October 1990
60 :
70 *SLOAD TRIANGLES
80 *FX4,1
90 MODE 0:OFF
100 A=1:B=25:C=1
110 FOR FRAME=A TO B STEP C
120 VDU23,27,0,FRAME|
130 WAIT
140 PLOT 237,0,0
150 IF INKEY-26=-1 THEN A=25:B=1:C=-1:
GOTO170
160 IF INKEY-122=-1 THEN A=1:B=25:C=1
170 NEXT FRAME
180 GOTO110
```

Listing 3

```
10 REM >Fractal Triangles 3
20 REM Single frame generator
30 REM by Mat Tizard
40 REM for all machines.
50 REM (c) BAU October 1990
60 :
70 MODE 0:VDU23;8202;0;0;0;
80 DIM X(3),Y(3)
90 FORN=1 TO 3:READ X(N),Y(N):NEXT
91 CO%=0:X=0:Y=0
100 REPEAT
130 R=RND(3)
140 PROCplot(X,Y,X(R),Y(R))
150 UNTIL CO%=250000
160 END
170 :
180 DEF PROCplot(C,E,F,G)
190 LOCAL x,y,L
200 x=(F-C):y=(G-E)
210 L=SQR((C-F)^2+(E-G)^2)
220 IF L=0 THEN ENDPROC
230 X=C+(L/2)*x/L
240 Y=E+(L/2)*y/L
250 PLOT 69,X,Y
260 CO%=CO%+1
270 ENDPROC
280 :
290 REM Vertices-
300 DATA 1280,0,640,1024,0,0
```

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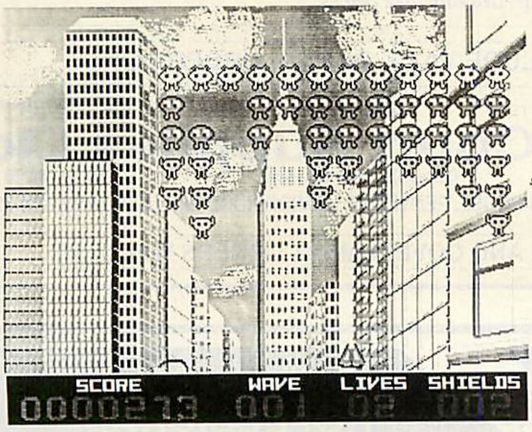
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DFS for the Archimedes/A3000

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All operations can be performed from the RISC OS desktop, with the DFS disc appearing on the icon bar in the normal way, and displaying its files in a window. Alternatively, the facilities are all available as 'star' commands. ArcDFS is fully compatible with the BBC 6502 emulator. Many additional features are built into the system such as the ability to set up virtual DFS drives on an ADFS hard or floppy disc, and a DFS ramdisc.

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The book describes in detail how to put the RISC OS Desktop to best use, and also documents the programs on the Applications Discs provided with the machine.

But the book also goes beyond this and describes the sort of software and hardware additions available to the Archimedes owner, and how to choose and install them.

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PLAY AWAY



The Universal main menu provides a user-friendly interface

Hybrid Technology's Music 5000 Synthesiser Universal offers you an effective way of expanding your Beeb's musical capabilities. RICK COCKER elaborates

All music software programs for the BBC micro rely on the Beeb's internal sound chip for their musical output. With clever programming and full use of what is still a very powerful ENVELOPE command, impressive results can be achieved.

But no amount of programming can overcome deficiencies in the square wave 'beep', especially in music education.

MIDI could provide additional benefits, but, since we are talking here of making full use of existing software, MIDI is not an option (see MIDI in the classroom).

Music education demands:

- Basic musicality to stimulate pupils to play/compose more
- A wide range of pitch
- Perfect tuning for aural training
- Sufficient voices to facilitate polyphony

What is required is a device that can be attached to the BBC computer, enabling all existing and future music software packages to play an enhanced sound, replacing the computer's 'beep'. This is precisely what Hybrid Technology's Music 5000 Synthesiser Universal does.

The Universal is an add-on, which can become an integral part of the computer without software modification.

What you get

The Universal comes with Music 5000 Synthesiser, Ample Nucleus Rom (16K), Universal issue disc (dual 40/80-track DFS format), fit-on key card, eight-page user guide, music software catalogue (of compatible programs), connections and plugs.

All you need is a BBC Master, monitor or TV, 40 or 80-track disc drive, a blank disc and one or more music software packages. A BBC Master is required because the Universal makes full use of its numeric keypad and sideways Ram.

You can use the Master's internal speaker, although results are more rewarding and potentially more creative connected to a music centre or hi-fi (with headphones and cassette recorder as useful extras). Hybrid Technology can provide a Music 1000 amplifier, speakers and headphones.

The Ample Rom is fitted either inside the computer or a Rom cartridge. The Music 5000 is fitted to the 1MHz bus and mains and audio output are connected. With power on, you simply follow the instructions supplied with the issue disc to make a Universal start-up disc.

Finally, the key card is fitted over the numeric keypad on the Master's keyboard.

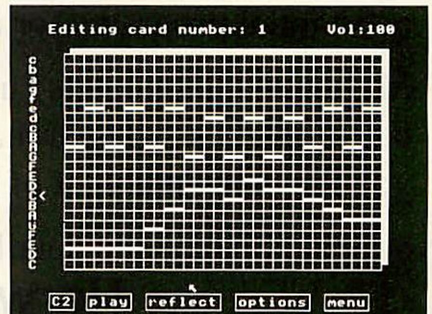
What's on offer?

So, what enhancements does Universal offer? Well, 16 instruments are available and directly replace the ordinary 'beep'. All are very playable – the piano, in particular, sounds very realistic. Compositions played by the computer can be used for accompanying an ensemble, or recorded onto tape, to motivate further musical exploration.

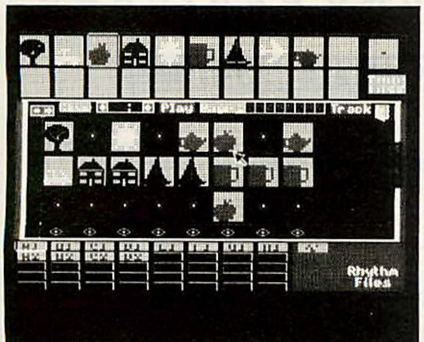
Tuning is perfect and adds a new dimension to aural and theory packages. Envelopes present in Associated Board aural programmes are followed by Universal's instruments to provide correct articulation and dynamics.

Tuning to other instruments is simplicity itself, requiring just two keys (sharper and flatter) – a boon for ensemble work and recorder tutor-type programs. The range covers nine octaves, with each instrument transposable in octave intervals.

All packages benefit from the enhanced sound quality, while some – such as *Basic*



Basic Music Composition: four parts



Compose Play: creative flow

Music Composition by Tobin Music – have already adapted their software to add an extra sound channel to give four-part polyphony. Only two music software packages fail to work with the Universal – *Peter Beater's Musical Games* and *Music System*, both from System Software.

Universal software includes a list of recommended settings for all supported programs, learns the programs you are using and saves the appropriate sound settings to disc. Alternative sound settings can be created, thus enabling settings of individual pupils, groups or projects, to be saved.

A 'back-up' facility enables a personalised disc to be created and stored along with associated compositions. A maximum of eight sounds can be played at once – an option that programmers and software developers should make the most of.

In use

When running the software it is important to remember that you are always dealing with two discs, the first being the Universal start-up disc, the second the music software package of your choice, which is referred to as the 'program disc'.

Loading is a simple operation with on-screen instructions prompting every action. Once Universal has identified the program disc, you are presented with the main screen. This displays the program title and the sound settings it provides for that particular program. Settings may still be altered or printed out for filing. At this stage sounds can be played on the Qwerty keyboard, which is laid out as a musical keyboard (displayed in the user guide).

The numeric keypad becomes the voice and sound keys and, while their orientation on screen is not that found on the keyboard, this is not a problem, as they are soon learnt with the aid of ears and key card.

Voice keys select a voice while the sound keys alter the instrument on that voice. Instruments are: piano, glockenspiel, flute, organ, strings, bars, pipes, glass, tines, stars, saws, springs, tom, bass, snare, cymbal. Off produces no sound. With auto on, and assuming the music program offers envelope selection, then Music 5000 instruments are chosen by the program's own controls.

Four voice keys are available to adjust individual voice's sound settings. Sound key controls include: instrument selection, tuning up or down a whole tone, transposing up or down in octave steps, ensemble (adding a second 'player' to enrich the sound) and sustain. RETURN plays voices 1 to 3 together. Each voice has its own stereo position which facilitates easy identification of parts when studying polyphony.

The sound keys are active at all times. While the sound settings' display is on screen, changes are reflected there, but once the program has loaded, changes are made by ear – good aural training. Even as I write this article on my wordprocessor, the sound keys are still active.

Within the program, operation is as normal, but with the addition of Universal's sound keys. The obligation to change to a new page to alter the instrument – for example, *Compose Play* – is no longer necessary, thus avoiding interrupting attention and creative flow.

A major advantage of Universal is the ability to change settings while the music is playing. In programs such as *Basic Music Composition*, it is a simple matter to place, say, a sustained 'glock' instrument onto the melody line and an ensemble of 'string' and 'organ' on to the harmony lines.

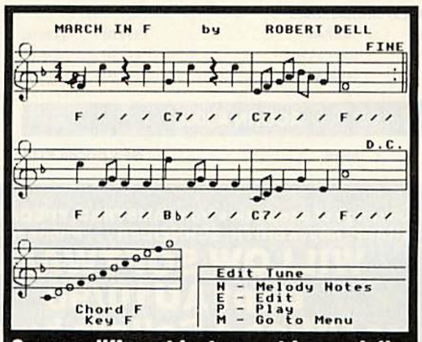
With three part programs – for example, *Compose Play* or *Opus* from The Advisory Unit – each line of music can play a different instrument with its own stereo position.

Finally, I must point out key 8 on the keypad. This switches between Music 5000 sounds and the standard 'beep' sound. If you want to hear just what an amazing difference Universal makes, try switching when music is playing!

Conclusion

The Music 5000 forms the heart of the Hybrid Music System, widely used in schools. The Music 5000 Synthesiser Universal is fully integrated within this system, enabling current 5000 owners to upgade to a Universal by buying the Universal software package. Universal owners may upgrade to the complete system.

As an Ample user, I would have liked the option of increasing the number of instruments that may be selected but, given the area in which Universal is most likely to be used, this is a minor niggle.



Opus: a different instrument for each line

Musical development in composition, listening and performing can be greatly enhanced with the aid of a computer, as many teachers and pupils now appreciate. However, growth may be hindered if the child is presented with an overtly complicated system engendering 'techno-fear'. The Music 5000 Synthesiser Universal addresses this problem head on – and solves it.

Hybrid Technology is the only music hardware/software developer consistently offering educational support. The company listens to what educators say, takes appropriate action and should therefore receive serious consideration.

MIDI IN THE CLASSROOM

Only *Compose* and *Compose Play* from ESP support MIDI. In view of this, plus the observation that some regard MIDI as a gift from above, a few words are necessary to underline the situation.

Although MIDI is essential for the professional and can be productive in secondary schools, in middle and particularly primary schools, it can present more problems than it solves.

'It doesn't sound the same!' is a frequently-heard cry when re-playing a piece of music saved last week, someone having changed the sounds or MIDI channel(s). On many multi-timbral expanders, voice selection from computer and voice storage to computer is impossible without specially written software for each instrument.

Tuning to a classroom instrument is vital and therefore must be easy to do. MIDI provides no 'tune all instruments' command, this being achieved on an individual instrument basis.

Connecting (and keeping connected) a MIDI system involves maintenance time the busy teacher just does not have.

Universal has none of these problems.

HOW IT WORKS

The BBC micro was designed to accept an add-on sound synthesiser. It is this forward thinking that makes the Universal system so powerful and thus transparent to the user. It uses standard OS vectors providing legal extensions to the existing SOUND and ENVELOPE commands. Programs that do not work with the Universal will be using illegal routines to access the sound chip directly.

The 1MHz bus has an audio input which the 5000 synthesiser uses, letting its sound be heard via the internal speaker. This is achieved by inserting the plug provided, which has an internal link to redirect the sound into the computer.

READER OFFERS

ARCHIMEDES

ZARCH

David Braben, author of *Zarch*, is also the co-author of the unanimously acclaimed game *Elite* – probably the world's highest selling computer game.

After months of program development work, David finally harnessed the speed and performance of the Archimedes computer to create another programming masterpiece.

Zarch is unlike any game you have ever seen before. Even the demonstration program, *Lander*, supplied on the Archimedes Welcome disc, can only give the most basic idea of the features and fascination that *Zarch* has in store.

The three-dimensional landscape is realistically portrayed by skilful use of 256 colours, area shading and accurate perspective design. The multi-directional smooth-scrolling movement is also enhanced by the use of twin screens: one is viewed while the other is updated.



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Offer Price £14.95

REPTON 3

The Repton series of games is the most successful software ever published for the BBC micro and Electron computers and has been described as 'The thinking man's arcade game'.

Now, a massive enhanced version is available for the Archimedes, comprising four complete games:

* REPTON 3 * THE LIFE OF REPTON * AROUND THE WORLD IN 40 SCREENS * REPTON THRU TIME

Enhanced features include a choice of four tunes and a position save/recall facility. In addition the software includes a sophisticated Screen Editor and Character Editor with a choice of 16 colours from a total of 4,096 hues. Plus you can design new screens and immediately test them by entering the game section.



RRP £19.95
BAU Discount £5.00
Offer Price £14.95

BBC MICRO / MASTER / ELECTRON

RICOCHET

Ricochet has an amazing 330 different action-packed screens arranged over five levels. You get five games in one, since each level has its own distinctive theme, with superb graphics and unusual puzzles to solve.

You control SPRAT, the Small Partially Robot Alien Time-traveller, in his quest to collect the five hour-glasses from the five worlds of *Ricochet*.

SPRAT can roll left and right and up and down ladders and ropes, but his unique ability is that he can jump to different heights and in different directions. You have to control the fast-moving alien as he ricochets through the levels.



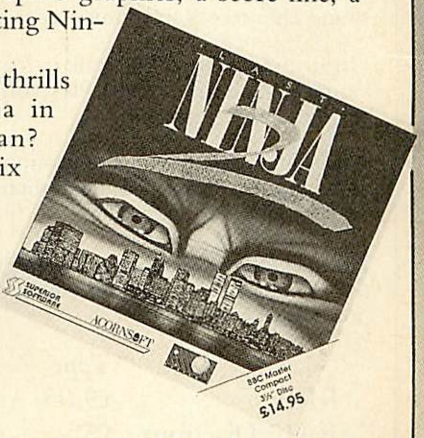
	Cassette	5.25 in disc	ADFS disc
RRP	**£9.95**	**£11.95**	**£14.95**
BAU Discount	**£2.00**	**£2.50**	**£3.00**
Offer Price	**£7.95**	**£9.45**	**£11.95**

LAST NINJA 2

Born in a time of peace, lived in a time of war, the shadow warrior returns. Leaping the abyss of time he comes to fulfil his destiny!

If you enjoyed *The Last Ninja* you'll go crazy over *Last Ninja 2*. There are lots more fiendish adversaries, more colourful screens with superb graphics, a score line, a timer and lots more exciting Ninja action.

Are you ready for the thrills and skills of the Ninja in crime-filled Manhattan? Can you survive the six action-packed levels?



	Cassette	5.25 in disc	ADFS disc
RRP	**£9.95**	**£11.95**	**£14.95**
BAU Discount	**£2.00**	**£2.50**	**£3.00**
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UTILITIES

COULD YOU USE SOME EXTRA CASH?

If you have written any handy articles, why not send them to us?

If we like them we may either offer to publish them in the yellow pages or, if they're good enough, we might consider offering them through the mail order section.

Either way we will pay generously for anything we use. So earn yourself some extra money (and fame) by sending your programs to:



The Editor
BAU
20-26 Brunswick Place
London
N1 6DJ

Please enclose SAE if you want your disc returned

NOW YOUR BBC MICRO CAN TALK BACK FOR AS LITTLE AS *£4.95!*

Speech! is an incredible piece of coding, needing no extra hardware and taking up just a few K of memory, it converts your BBC's sound chip into a full-blown speech synthesiser!

Once installed you can call it from your own programs with simple-to-use commands. Plus you can fully configure it to speak in any accent or pitch.

And you can teach it how to pronounce unusual words and phrases – adding them to the built-in dictionary – customising *Speech!* to your own requirements.

Due to a bulk purchase we can offer this unique program to you for less than half price. But place your order soon as they're sure to be in high demand.

	Tape	*5.25in*	*3.5in*
RRP	£9.95	£11.95	£14.95
BAU Discount	£5	£6	£7.50
Offer Price	**£4.95**	**£5.95**	**£7.45**

Please note: *Speech!* is not compatible with the Electron

The program is not supplied in its original packaging but is complete and fully working.

THE TOTAL DTP SOLUTION

For a limited period we are offering *The Publisher* PLUS four extra discs giving a total of 86 different fonts for only £49.95!

The Publisher is a remarkably easy to use and powerful desktop publishing package, featuring its own page description language, allowing you to operate it from within *Wordwise, Wordwise Plus, View, Interword* or *Wordpower*, and giving you total control over the layout of your documents.

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But remember, this is a limited offer, so to be sure of your *Publisher* kit order your copy soon.

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HARDWARE

We have secured exclusive rights to offer the last few remaining Tandy FP215 Flatbed Plotters at an incredible saving of £400!

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If you wish to order yours over the phone, or reserve one prior to ordering by post, please call our mail order hotline on: 0672 40825.

Remember this is the last time this offer will appear.

Specifications

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★ The ideal companion for CAD programs

RRP £699
BAU Discount £400

LAST FEW REMAINING

Offer Price £299

Save over 20% on the unique folding Microdiary

Specially designed so that it fits easily in your pocket or wallet, but opens out to give two manageable sets of keys and a two-line display, the 20k Microdiary is the ideal way to keep your important information instantly to hand.

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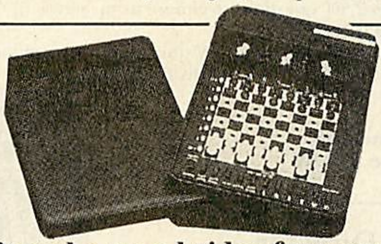
And the best news of all is that for a limited period we have reduced the price of this unique device by £10. For just £39.95 you'll have one of the easiest, cheapest and most secure means of managing your personal data.



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* Address and telephone number storage
* Accurate clock * Alarm function
* 10 digit display calculator
* 24 World time zones
* Memo function
* 20k memory

RRP £49.95 BAU Discount £10.00

Offer price £39.95



If you can't make up a bridge foursome, try the Dual Screen Bridge Computer

Only slightly larger than a paperback book, yet featuring 28 keys and two displays, the Dual Screen Bridge Computer is the ideal way for you to practice bridge.

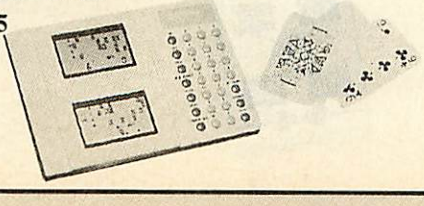
Targeted at beginners to intermediate players it will help you improve your skills of bidding, playing and recall. While, if you are an advanced bridge player, the Bridge Computer will help you to keep your hand in.

And for just £49.95, saving £10 off the recommended price, you're sure to find it helps your bridge playing to improve — as well as being a fun pastime you can play anywhere.

* 4 levels of play
* Plays 3 hands
* Random cards generated for each hand
* You bid against the computer
* You can be dummy, declarer or defender
* Checks for and disallows illegal play
* Displays your cards, the dummy's hand, bidding, playing and vulnerability, and the results of contracts and tricks

RRP £59.95 BAU Discount £10.00

Offer Price £49.95



The go-anywhere Pocket Chess Plus Computer

This is a truly pocket sized chess computer featuring a touch sensitive board so you can forget about entering fiddly coordinates because the Pocket Plus knows where you move each piece.

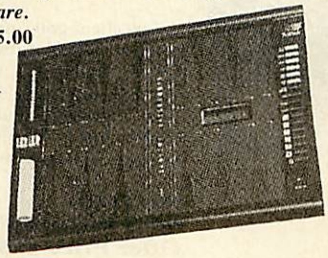
It comes with a comprehensive coaching facility which teaches tactical manoeuvres, warns you if a piece is in danger and even shows you its thinking.

Programmed with several difficulty levels, whether you are a beginner or a master, the Pocket Plus will give you a challenging game — every time. And it even remembers the state of play when you switch it off.

Normally the Pocket Plus sells for £34.95, but if you buy it from us we'll knock £5 off the recommended price. For just £29.95 you're guaranteed hours of enjoyment — where ever you are.

RRP £34.95 BAU Discount £5.00

Offer Price £29.95



Save £15 on the Saitek Sensory Backgammon Computer

This is a superbly presented portable or table-top backgammon computer which, like the chess computer, has a touch sensitive board so that it knows where you move the pieces.

It features 9 levels of play with a quick response program and a fully automatic random dice display. And if you don't want to play the computer you can use the board to play a friend too.

Recommended at £69.95, we have slashed £15 off the price of this superb product. Order yours today for only £54.95.

RRP £69.95 BAU Discount £15.00

Offer Price £54.95

MASTER COMPACT



Brian Clough's Football Fortunes

Brian Clough's Football Fortunes is a football management game with a big difference. In an exciting departure from earlier simulation games it combines an excellent range of computer based features with a fascinating board game.
Can you compete with human and computer managers to successfully steer your team through the season, using your skill to make it stronger as you proceed?
With the program you get a large playing board, over 100 player cards, stacks of money, some counters and a comprehensive instruction manual. And for only £7.99 you're guaranteed hours of inexpensive yet intense, action-packed excitement!



RRP £9.99
BAU Discount £2.00
Offer Price £7.99

Colossus 4 Bridge



Colossus Bridge allows one player to play a complete game of bridge with the computer controlling the other three hands. Each hand is bid according to the Acol system, while other standard conventions are also available.
If you're a beginner at bridge you can make use of the in-built tutor which has 10 specially chosen hands to illustrate the principles of the game.
In fact, for just £10.99, whether you're a beginner or a more advanced player, you'll find Colossus Bridge is the ideal partner, either for practise or when you can't get another three people together for a game.

RRP £14.99
BAU Discount £4.00
Offer Price £10.99

Tank Attack

Tank Attack is a computerised board game for two, three or four players, where each player takes the role of a General commanding a country's Tank Corps of one or more armoured divisions.
Your objective is to capture the enemy headquarters, which will require the planned strategic deployment of your forces and regular fire duels between your own and enemy units.
Weather, morale, skill, judgement, planning, foresight, careful management of rebuild and repair facilities and luck all play a part in deciding the result of each game.



RRP £14.99
BAU Discount £4.00
Offer Price £10.99

Birdie Barrage Golf



An excellent golf simulation offering you the chance to play at the famous Turnberry Ailsa, Belfry Brabazon, Carnoustie Championship and Acorn Park golf courses.
All the features you'd expect form a good golf game are here, including woods, water and bunkers.
And for just £7.99 this must be a game that should be in everyone's collection.

RRP £9.99
BAU Discount £2.00
Offer Price £7.99

Colossus 4 Chess

Probably the most complete chess program available for any home computer and written using the very latest techniques, by a computer chess programmer with over eight years experience.
Colossus perfectly understands the rules of chess and can handle all standard mates, while offering you the choice between a two- dimensional flat board or a stunning 3D display.
It comes with a comprehensive instruction manual and must be the best chess program for casual and serious players alike.

RRP £14.99
BAU Discount £4.00
Offer Price £10.99



Steve Davis Snooker

This has to be the best snooker simulation you can buy, which is surely proven by the fact that Steve Davis has endorsed it!
It includes a computer play option, infinitely variable speed, spin, friction factor, break score and a foul shot facility, as well as superb graphics.
If you fancy yourself as a good snooker player, for only £9.99 why not see just how good you are at the computer version.

RRP £12.99
BAU Discount £3.00
Offer Price £9.99



Sporting Triangles

No matter what your sporting preferences may be, Sporting Triangles is bound to intrigue, puzzle and frustrate you.
It includes over 2,500 questions to choose from, across 12 action- packed sports.
All the features of the top rating TV quiz show are combined in this superbly presented and equally compelling game.



RRP £14.99
BAU Discount £4.00
Offer Price £10.99

Football Director

Billed as the ultimate football challenge, Football Director features four leagues with 20 teams each, a 38 game season, home and away matches, FA and League Cups, replays and much, much more.
In fact it's so packed with features it really is almost like the real thing, including player's morale, substitutions, injuries, transfers, promotion and relegation, tax, interest, wages and many more than there are room to print here. At the virtually give-away price of just £9.99 Football Director will give you hours, if not days or weeks, of action-packed excitement.

RRP £12.99
BAU Discount £3.00
Offer Price £9.99



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Five superb games on one disc:
* Ravage
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* Diamond Mine
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And we're putting our money where our mouth is. If you take out a subscription (or renewal) before August 31st 1990 we will give you one of these superb games (worth up to £19.95) absolutely free!



So why not subscribe today? For only £22.95, you'll get a lot more than the next 12 issues of *BAU*.



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The Small Print

Please note: Due to the popularity of our subscription offers we have had to adopt the following rules:

1. No more than one free gift will be allowed per subscriber per year (unless you renew your subscription early. In which case your free gift will be supplied within 28 days). This means that we will no longer allow people to cancel their subscriptions and then re-subscribe to get another free gift.
2. This offer replaces all previous subscription offers as stocks of free gifts from previous offers are no longer available.
3. Please remember that your free gift will be despatched separately from the first issue of the magazine to which you subscribed or renewed.

ONLY £22.95



D I S C S



PLEASE SEE THIS MONTH'S YELLOW PAGES FOR FULL DETAILS

Why not buy the BBC Acorn User monthly disc?

You know that *BBC Acorn User*'s yellow pages consistently bring you the best in new software for your BBC or Archimedes each month.

But why not save the wear and tear on your fingers, and get programs that work the first time by ordering this month's disc.

As usual it's packed with plenty of software for everyone.

NEW LOW PRICES

5.25in disc £4.95
3.5in disc £5.95

The Monthly Disc Subscriptions Are Back!

Ever since the expiry of our previous Monthly Disc offer in the January 1990 issued, we have been inundated with requests from readers asking if we can backdate disc subscriptions for them.

We always listen to our readers (after all, it's your magazine) and try to include as many of your suggestions as possible in *BBC Acorn User*. In this case your response has been so overwhelming that we have decided to make the monthly discs available from now onwards — for just the cost of the discs, post and packing.

We are producing this offer at such a low price as a special reader service and there is no time limit or closing date. We hope that in the months and years to come you will make use of, and enjoy, this service which provides a valuable addition to your BBC/Acorn software collection.

How it works

If you currently have a magazine subscription (or intend to subscribe) we will be able to send your discs with the magazine, saving much of any extra postage charges. So the cost in the UK will be just £5 for the next twelve 5.25in discs, or £10 for 3.5in (Making less than 42p each for 5.25in, or 84p for 3.5in).

Here is a breakdown of the prices if we send your discs with the magazine. (Remember that the magazine subscription price is not included):

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Overseas (Airmail)	£19.00	£24.00

If you are not a subscriber to *BAU* but would still like the Monthly Discs, there is an extra charge to cover the cost of postage and additional protective packaging. This still means that, in the UK, the 5.25in discs will cost you less than 67p each, while the 3.5in discs will be less than £1.09.

Here are the various worldwide prices:

DISC ONLY	5.25in	3.5in
UK	£8.00	£13.00
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Overseas (Airmail)	£30.50	£35.50

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ORDER FORM

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SUBSCRIPTIONS

with FREE game (UK only)
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Last Ninja 2	☐	☐	☐	—
Zarch	—	—	—	☐
Repton 3	—	—	—	☐

Please tick the FREE game you require

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Sam 10	16098 £9.95 ☐	16195 £9.95 ☐	16292 £11.95 ☐	1639X £14.95 ☐
Sam 11	16405 £9.95 ☐	16411 £9.95 ☐	1642X £11.95 ☐	16438 £14.95 ☐

(All Sams must be on the same format)

Question of sport	☐ 16500 £6.45	☐ 16519 £7.45	☐ 16527 £9.95
Trivial Pursuit	☐ 16608 £14.95	☐ 16616 £19.95	

	Tape	BBC 5.25in disc	BBC 3.5in disc	Archimedes
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LastNinja	☐ 1673X £7.95	☐ 16748 £9.45	☐ 16756 £11.95	–
Zarch	–	–	☐ 16764 £14.95	
Repton 3	–	–	☐ 16772 £14.95	
Zarch	–	–	–	☐ £14.95
Repton 3	–	–	–	☐ £14.95

HARDWARE

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Tandy Flatbed Plotter	☐ 11215	£299.00

UTILITIES

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The Publisher		☐ 17124 £49.95	☐ 17116 £49.95

ELECTRON

NTQ two-Rom pack ☐ 15008 £19.95

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COLOUR CHECK

Colour laser printers are expensive, but mono dot matrix models with a colour addition offer a cheaper alternative. **MALCOLM BROWN** goes through six options

When it comes to drawing or digitising on screen, an Arc takes some beating. Even the BBC micro can go a long way towards electronic art.

But once a screen masterpiece is finished, producing a paper copy to hang on the wall can be tricky – and expensive.

The biggest problem is colour. Although excellent monochrome printouts can be achieved with the better 24-pin and laser printers, only a colour laser printer costing thousands of pounds can really reproduce the colours seen on screen.

But don't despair. Less expensive, though slightly more limited, colour printing is possible. Just like colour monitors, colour printers rely on an optical trick.

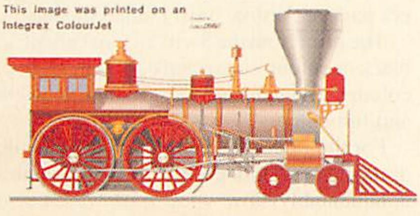
Only four colours of ink are ever used (usually red, yellow, blue and black) and these are combined on the paper to produce a range of other colours.

At the budget end of the market, it is difficult to accurately control how much of each colour ink is deposited on the paper. Only simple one-to-one combinations of colour are possible, limiting the colour range of a printer to just seven colours – red, orange, yellow, green, blue, violet and black.

That's fine for the BBC micro but, for the Archimedes, intermediate colours must be 'fudged' by dithering techniques – and that is down to the software.

The cheapest type of colour printer is a dot matrix printer. The models looked at here are the normal monochrome models fitted with the colour option – an extra servo motor and a multi-coloured ribbon. The prices quoted include this option.

This image was printed on an Integrex ColourJet



These machines can be used as general purpose printers, as well as for producing colour dumps, so the quality of the text produced has also been assessed.

Coloured text can be used to great effect in letters, reports, and so on, and these printers produce text which is as good in colour as in black.

Text print speeds are the same when printing in any of the 'primary' ribbon colours. But, when a mixed colour is printed, each character must be printed twice and some extra time is taken to shift the ribbon.

This slows down the process. However, the printing speeds quoted here are for colour printing, so they can be compared with previous *BAU* printer tests.

When printing colour graphics, the shortcomings of a printer show up more than ever. Models which print excellent quality text can produce uneven areas and smear colours when it comes to graphics.

The printers also show a different range of speeds when it comes to printing graphics. The speed of the printer's interpretation of the complex data produced by the software affects the overall figure as much as the time taken to actually print the data.

We tested each dot matrix machine printing a simple test 'picture' to assess its graphics speed. The figures are not in real time, but can be compared between machines.

Fortunately there is just one main 'standard' of control codes for colour dot-matrix printers – the Epson JX standard, often enhanced to produce higher resolution colour graphics with later LQ machines. All of these models have JX emulation.

Colour inkjet printers are designed for colour from the start and can provide excellent results, but tend to cost much more than dot matrix machines.

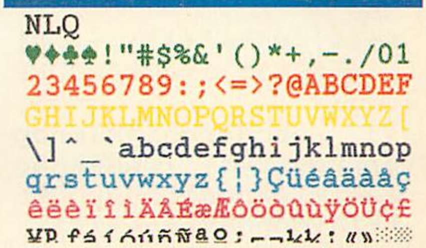
They cannot produce such good text print as many (cheaper) 24-pin dot matrix printers, so they are not so suitable for general printing work. However, for colour graphics, the results are superb.

Inkjets also use four 'primary' colours and can produce seven colours on paper (or on celluloid for overhead projection), or more with dithering. The greater control of the quantities of ink deposited on the paper means graphics are much smoother and more even than with dot matrix printers.

Colour inkjet printers do not follow any particular control code standard, so a useful comparison of graphics printing speeds is not possible. If your dump software or printer driver is not compatible, be prepared to write the programs yourself.

Star XB24-10





Star's XB24-10 is a lot of printer for the money. Not only is it simply equipped to print in colour, but it can also imitate a 48-pin printer (Epson's TLQ4800).

The XB24-10 uses a two-pass NLQ (near letter quality) to effectively double the number of pins in the printhead, giving a better print quality. However, the two passes slow the printer considerably, so it also has a normal one-pass NLQ mode.

Otherwise, the XB24-10 (and the wide carriage XB24-15 costing £219 more) looks much like any other 24-pin printer. It has a push feed tractor unit built-in for fanfold paper and friction feed, with an efficient automatic paper loading for cut sheets. Paper parking for quick changeover between the two is also included.

The XB24-10 is compatible with both Epson's LQ standard of control codes and IBM's Proprinter, extended for colour.

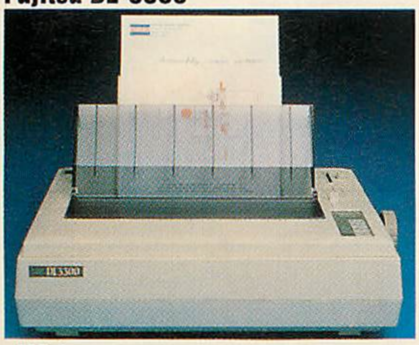
The normal text print from this machine is superb. Draft is clear and fast and the NLQ is excellent quality and is also speedy. The SLQ (super letter quality) 48-pin imitation is only a little better and not worth the slower speed, but it is there if needed.

In colour, the text is still extremely good, albeit a little faint sometimes. Printing graphics, this machine lacks evenness and brightness and some smearing of colours (especially evident in areas of yellow) also occurs. The graphics speed is about average

for the price. There is a choice of seven NLQ character styles and two SLQ. Extra styles can be added with plug-in cartridges which cost £56 each.

If colour is the primary concern, then perhaps the XB24-10 is not a suitable first choice. However, for an all-round 24-pin printer with several useful extras and easy-to-use features, including more than competent colour, the XB24-10 is hard to beat.

Fujitsu DL-3300



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Without its colour option, the DL-3300 is every inch a 'model' mid-range 24-pin printer. However, colour costs £144 above the normal price – definitely over the top – and it's hard to fit too.

The DL-3300 is well built and should serve well for many years. Both fanfold (push feed) and cut sheet paper are catered for. Cut sheet paper is efficiently loaded and automatic fanfold paper parking makes switching between the two fast and simple.

There are two qualities for draft print available, one better than the other, but slower. The high speed draft is quite readable and its speed makes it preferable.

In NLQ mode, the print is reasonab ly fast and excellent quality – fine, crisp and precise, and as good in colour as in black.

Just one style of NLQ is provided – lean for this price – but plug-in 'smart cards' provide others (£79 for two extra typestyles).

The DL-3300 can emulate almost every printer control code standard: Epson FX and JX; IBM Graphics Printer and Proprinter; Fujitsu's own DPL24C, DPL24D and DPL24I, and the Diablo 630 daisywheel.

Printing colour graphics, the DL-3300 does extremely well with bright, even images almost completely untarnished by smears or glitches. It is rather slow, but the results are worth waiting for.

The controls on the DL-3300 are deceptively simple. Two complete set-ups can be programmed into the printer (using a complex printed menu system) to be called up later with a couple of button presses.

The DL-3300 is a well made, efficient machine which performs well in normal and colour use. If, with the colour option, it was less over-priced, it would be a clear winner.

NEC Pinwriter P60



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The P60 is an updated model of NEC's P6 Plus with a new printhead and some extra features. A wide carriage version (the P70) is available for £219 extra.

Fanfold paper is fed by a push feed tractor unit from the back or the base of the printer, and cut sheets are loaded automatically. Using fanfold is economical, thanks to a tear-off button which winds the paper out for tearing and then back again to print the next page without wastage.

All the alterable parameters are stored in non-volatile memory and set with the front panel buttons, prompted from a printed menu and the two-digit LED display.

The P60 is compatible with only Epson's LQ standard and NEC's own. Six NLQ styles are available, although some can be printed only proportionally spaced.

A fast NLQ style is also available, but this is poorer quality than the other NLQ styles and only available in a plain draft-type font.

Normal NLQ is extremely fast, matched only by other printers costing about £1000. The quality is good, with clear sharp letters in any colour. In draft mode, the P60 beats all comers for speed in this price bracket.

Printing graphics, the P60 is less impressive. It is fast – completing the test in almost half the time of the DL-3300 – but the images tend to be rather smudged and sometimes certain colours do not fill the areas they are supposed to, particularly if the printhead pressure is not set carefully.

Although let down by the quality of its colour graphics, this is an impressive machine. It is very fast and produces good quality print. Unless you regard graphics as important, the P60 makes a fine choice.

Citizen Swift 24



NLQ
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Not many cheap 24-pin printers support colour printing, which is a shame, since the quality of print is similar. It is speed and extra features which most affect the price.

The Citizen Swift 24 is almost the cheapest 24-pin printer available, yet it offers a wide range of features, including an equally cheap colour option.

Tractor feed (switchable to push or pull feed) and friction feed (with automatic paper loading) are provided. It even provides paper parking, unlike most budget models.

The print from the Swift 24 is excellent, in black or colour – crisp and dark. The Citizen colour ribbon also gives particularly bright and full colours.

For the price, the Swift 24 is fast in both draft and NLQ modes. But printing graphics is lamentably slow – test time was almost

MODEL	Value for Money	Print Quality	Overall Performance
Citizen Swift 24	*********	********	********
Fujitsu DL-3300	*******	*******	********
Integrex Colourjet	********	**	********
NEC P60	*******	*********	*********
Sharp JX-730	***	******	*******
Star XB24-10	********	*********	********

two and a half times that of the slowest of the others. However, the quality of the colour graphics is good, if a little faint.

Four NLQ styles are provided built-in and further fonts can be added with plug-in cards for £40 each. Also, any of the fonts can be printed with shadows, in outline and reversed white on a coloured background, which increases the possibilities.

Epson LQ and IBM Proprinter emulation is provided and – uniquely for such a cheap printer – a two-line LCD display indicates what is going on, or what has gone wrong.

The same display is also used to set up the machine with up to four 'macros' which can be selected for different uses of the printer.

The Swift 24 packs a tremendous range of facilities into such a low priced machine. It handles colour well and provides an easy way into colour printing. If only it were faster, it would score well above other machines costing twice as much.

Integrex Colourjet 132



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The Colourjet is a colour inkjet printer and a well known and popular design in the Acorn world, particularly in education.

This printer uses piezoelectric vibrators to expel ink from its nozzles and has just one nozzle for each colour – so it can only print one dot at a time.

Although the printhead is fast, the whole process of building up a line of text takes time, so this is not a fast printer.

Nor is the quality of text print high. Characters are based on a grid of only 5x8 – about half the resolution of the cheapest monochrome nine-pin machine.

A double strike mode helps to cover up the deficiencies, but this slows the already tardy print speed still further. The Colourjet cannot really be considered for the production of good quality text.

However, for graphic images, the Colourjet presents an altogether different picture. Although the resolution of its finest

Make & Model	Basic Price	Colour Option	Claimed Speeds Draft	Claimed Speeds NLQ	Measured Speeds Draft	Measured Speeds NLQ	Measured Speeds Graph	Interfaces Centronics	Interfaces RS232	Tractor Feed	Compatibilty Epson	Compatibilty IBM	Compatibilty Other	Built-in Styles	Plug-in Styles
Citizen Swift 24	£389	£38	160	53	93	40	1.1	●	£25	●	LQ	Pro	NEC	4	£35
Fujitsu DL-3300	£599	£125	240	60	115	49	2.1	●	£25	●	FX JX	Pro Graph	Fuj Diab	1	£125
Integrex Colour Jet 132	£636	N/A	40	–	27	–	N/A	●	£108	–	–	–	Can	1	–
NEC P60	£649	£85	300	100	164	60	3.4	●	£85	●	LQ	–	NEC	6	£60
Sharp JX-730	£1295	N/A	70	40	75	34	N/A	●	–	£165	–	–	Sharp	1	–
Star XB24-10	£599	£69	200	67	125	49	2.8	●	£69	●	LQ	Pro	–	7	£49

printout is only 192 dots per inch (equivalent to any nine-pin dot matrix machine), the small size, evenness and regularity of the dots ensures the printout appears to be a much higher resolution.

Relatively little ink is deposited on the paper, so the colours can be a little faint. Solid blacks, in particular, appear grey.

And, of course, the speed means even a relatively simple screen can take several minutes to print.

The Colourjet uses its own peculiar control codes but, over the years, many Beeb dump programs have been written (one is reproduced in the manual) and a Risc OS driver is also available.

A viewdata mode, especially for printing screens from viewdata terminals, is useful for mode seven screens.

The ink is held in two plastic slot-in cartridges which are simple to replace, but last for only 1500 pages of text – much less with graphics. The Colourjet can use only roll paper, or cut sheets at a pinch.

The Integrex Colourjet isn't really suitable as a text printer but for colour screen images nothing can beat it at this price.

Sharp JX-730



NLQ
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The JX-730 is another colour inkjet with a price not for the fainthearted. This is a wide carriage machine so, where the software allows, it can produce sizeable pictures.

The JX-730 uses a heated chamber method of ink ejection and it has 48 nozzles in the printhead, split as 12 for each of the four primary colours.

This equates the JX-730 with most nine-pin printers as far as a nozzles-to-pins comparison goes, but it is roughly of equal quality to a 24-pin printer for dot density. Text characters consist of a 18x24 dot grid – equivalent to most 24-pin printers – and the difference in quality over the Colourjet is clear. However, on this score, a £400 24-pin machine beats it hands down.

At a pinch, the JX-730 serves adequately as a general purpose printer if required.

For printing graphics, the JX-730 excels. It can lay down no more than 153 dots per inch (less than the Colourjet), but the overall effect is a darker, stronger colour.

The JX-730 uses its own brand of control codes, compatible only with other Sharp printers. There is no commercial Acorn software to use this printer, so you would have to write your own dump program.

The JX-730 uses only cut sheets and roll paper, but a tractor unit is available. Each ink reservoir has a low level warning light and is filled by hand from small tubes. This is surprisingly simple and mess-free.

When the power switch is turned off, the printer does not turn off immediately but goes through a cleaning cycle first.

The JX-730 is certainly a capable machine and shows what can be achieved with colour inkjet technology. However, without Acorn software, and at this price, it cannot be recommended.

Conclusion

So, which is the best type of printer to choose? Well, if you want colour mainly for adding extra emphasis to text – or, indeed, if you also want this printer to serve as a general-purpose machine – then inkjet technology is not for you. Dot matrix is the answer and these four models all have something going for them.

The Swift 24 is fantastic value for money. It performs well in both mono and colour – if it were faster, it would be unbeatable.

If money is no object, the NEC P60 is equally good and very fast. Both machines produce as good colour graphics as can be expected from dot matrix.

The Star XB24-10 and Fujitsu DL-3300 are also capable machines and more medium-priced. But, if the extra cash can be found, the NEC is surely worth it.

It's a different story with the inkjet printers, which are of little use if general printing is required. However, when it comes to pictures, the Integrex Colourjet 132 surpasses anything else at this price.

PATTERN POWER

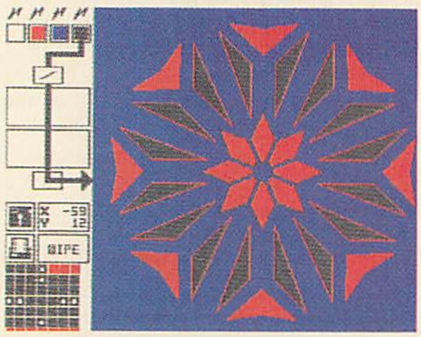
Two new programs bring the visual fun of symmetry into the mathematics classroom. **DAVE FUTCHER** examines them

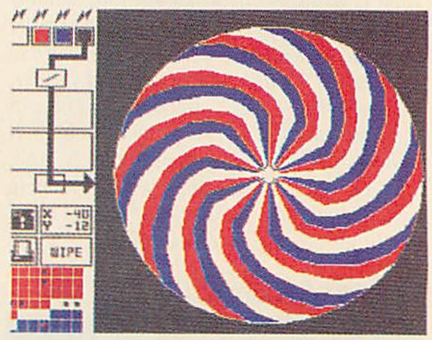
'Symmetry in planar geometry creates in the spectator a sensation of harmony, order and beauty.' *(Marta Koros-Milis & Rudolf Panuska)*

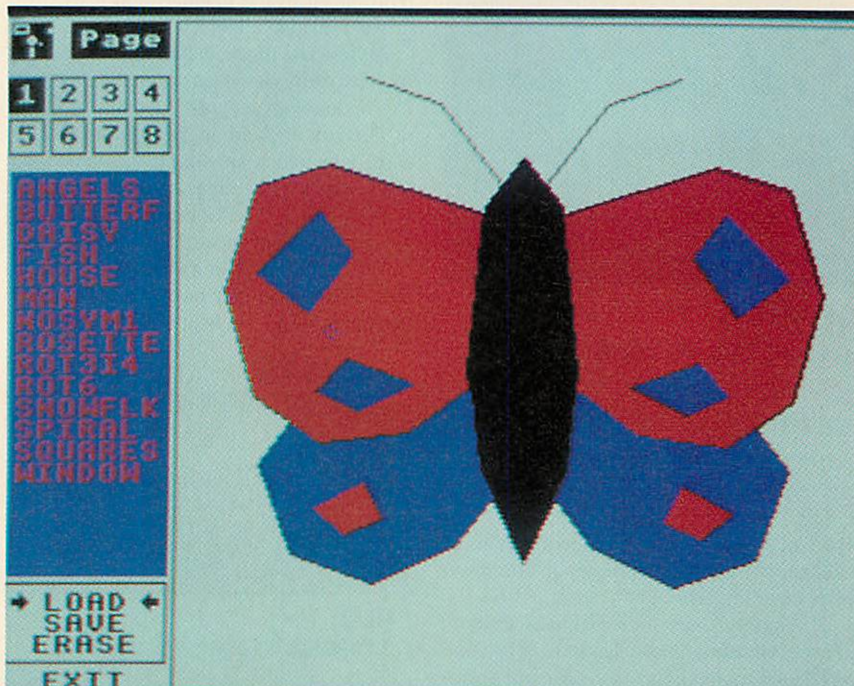
Over the centuries, symmetry (from the Greek 'sym-metros', meaning 'with length') has been a way of applying order in applications ranging from astronomy to mathematics and other sciences.

In education, children at an early age become aware of the practicalities of symmetry in the mathematics classroom – but, of course, symmetry is all around them in the environment.

Now, two new programs – *Kaleidoscope* and *Frieze*, from ESM of Cambridge – allow users to explore symmetry by making use of the mathematical concepts of rotation, reflection and translation to create simple and complex patterns.







A kaleidoscope of patterns can be created, teaching symmetry in the process

New geometric design

Back in 1984, Fred Daly, Bob Burn and Chris Forecast of Homerton College, Cambridge introduced a program called *Tesselations*. This striking, imaginative and intriguing piece of software allowed users to draw tesselating shapes, with the computer automatically providing symmetry in any of the 17 possible groups.

The same team is responsible for both *Kaleidoscope* and *Frieze*.

Kaleidoscope deals with two types of symmetry – reflection and rotation. It allows pupils to discover the world of kaleidoscopic patterns by rotating and reflecting images on screen.

Children can draw a colourful shape which can then be rotated and reflected endlessly around a centre point. The program actually makes possible what would usually be impossible using normal apparatus, such as mirrors – the setting up of mirror lines at 0 degrees and 29 degrees is easy on screen.

Frieze allows children to progress from the possibilities of *Kaleidoscope*. It is a pattern-generating program allowing translation symmetries in just one direction, with the motif repeated along the axis.

The possibilities are immense for creating frieze patterns, using a variety of transformation, and discovering how the various combinations of these symmetries can produce fascinating geometric effects.

There are four actual transformations illustrated by *Frieze* – translation, reflection, half-turn rotation and glide reflection. They can all map any line segment onto a line segment of equal length – hence they are called symmetries.

Frieze deals with the symmetries of particular patterns along an invariant line, which is always transformed to itself by any of the symmetries used. The patterns produced in this way are often called friezes – hence the name of the software. If you combine these four transformations to form a pattern going to infinity along one line, there are only seven possible combinations, called frieze groups.

Geometric control

Both packages, like nearly all computer art packages, use the cursor to draw designs on the screen in a designated drawing area.

The software has been designed so that a variety of devices can be used to move the cursor and draw with it. Usefully, the normal BBC cursor keys are quite an effective control, particularly when used with SHIFT to speed up the movement. However, a mouse, joystick, Marconi RB2 Trackerball,

Cumana Touch Pad, Grafpad 2, Touchmaster, or Concept Keyboard can be used without the addition of any Roms or special driver software.

Once *Frieze* is loaded, a large drawing area takes up the top three-quarters of the screen. Along the bottom of the section of the screen are various boxes for controlling the software.

On the far right of the control area is the Line/Fill box. A diagonal line shows when the cursor is set from drawing lines and to an F when set to fill. The fill colours can be selected from the four boxes alongside the Line/Fill box.

There are eight colours available, although only four can appear at one time in the colour boxes or on the screen. To view the range of colours, move the lightning flashes above the colours boxes. Alternatively you can hold down the SHIFT key and press f1, f2, f3 or f4 repeatedly to produce the same effects.

In many tasks precise drawing is important and *Frieze* has a magnify option which is selected by the appropriate icon. When selected, the box changes to display the x and y axis where the cursor is located, and in the middle of the control area an enlarged 7 x 7 image area around the cursor is displayed.

While working in the drawing area, it is possible to see the mirror lines or the centres of rotation by using the Axis On/Off box. Diamonds show the centre of rotation and dotted lines show the mirror lines.

It is also possible to change the spaces between designs by using the Spacing box, which is above the Magnifying glass box. The initial spacing is set at 32 pixels, but this can be altered easily by using the arrows that appear in the Spacing boxes.

Different symmetries can be controlled by the Symmetry box – this is located at the top left-hand corner of the drawing area. A lot of control is available – vertical mirror lines, horizontal mirror lines, centre of half turn rotation between and on mirror lines, and glide reflection.

As both packages are from the same authors the control of the packages is similar. But, because of the different geometric experiences offered they are not exactly the same as each other.

With *Kaleidoscope* , a control area is located down the left side of the screen leaving the rest as the drawing area.

Again the controls are clearly laid out and children find them easy to understand.

At the top of the control area are the Palette boxes. Initially white, red, blue and black are available, and like *Frieze* this can be extended so that four to eight colours can be used at one time.

Central to the *Kaleidoscope* program are the Symmetry boxes. These are located under the icon that shows whether the cursor is set to fill, draw or redraw lines. The first symmetry box is operated by two function keys; f5 selects Mirror/Rotate or neither, while f6 changes the angle or the order of rotation.

The second box operates in a similar way with f7 and f8 being the keys used.

Printing out

It is essential that packages like *Frieze* and *Kaleidoscope* have adequate printout facilities, and they do.

Both support a wide range of printers – Epson compatible eight-pin monochrome printers as well as a full range of colour printers. These include: the Star LC10C, Canon PJ-1080A, Radio Shack CGP-220 and the Integrex Colourjet.

Of course, colour printing is what packages like this are all about, and colour printers are now becoming increasingly popular in schools.

But when using the standard educational colour printer – the Integrex – there was initially some disappointment as the colours carefully selected by the children were not replicated by the colour printer. Pale pink on the screen was really white!

But once these differences are understood the children quickly adapt their colour choices to correspond with the colours that can be printed.

Frieze can be used to export designs so they can be used in devices like the Clwyd Technics Master Knit 200. The program will convert *Frieze* mode 1 screen pictures so that one screen pixel is equivalent to one stitch on a knitting machine.

Conclusion

Both these programs will provide the chance to use computers to generate and transform two dimensional shapes (Mathematics National Curriculum AT10 level 6).

They will also allow the children to meet a whole host of experiences detailed in the National Curriculum for the Shape and Space Attainment Targets.

Kaleidoscope and *Frieze* are both highly motivating programs. They are visually stimulating, but the power that they offer is also important.

Teachers and children can work in a geometric way with comparative ease and a design that would normally take a long time to draw and colour by hand can be accurately drawn and printed within minutes with either package.

Teachers who attempt to investigate symmetry using traditional methods often find that ideas can get bogged down in the time taken to produce patterns, correct errors and colour in. Using these programs, investigations can proceed with far fewer practical problems.

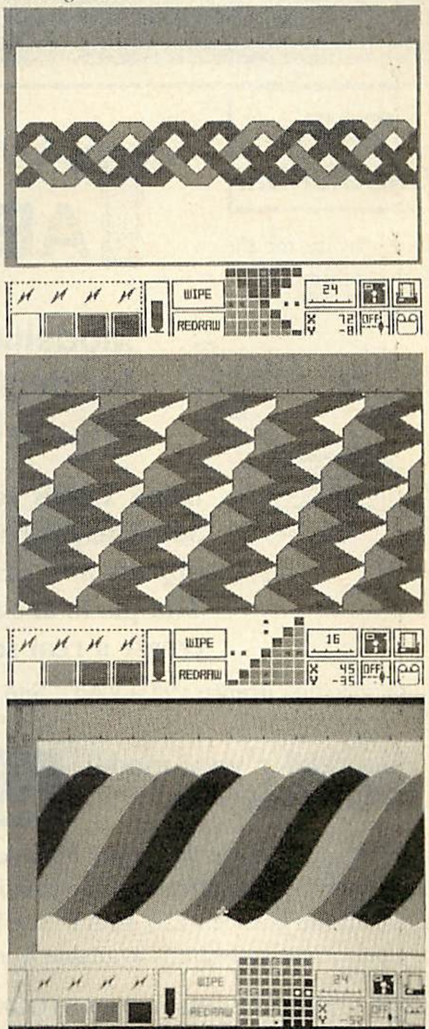
Both packages will certainly help to introduce and reinforce ideas like transformations in an investigative and interesting way. Therefore, most children will find themselves more involved and able to retain ideas more easily. They can work on the computer screen, evolving patterns as they go along.

But when using *Kaleidoscope* and *Frieze*, beware of the development of pretty patterns without the user developing any real understanding!

Careful teacher guidance is also important, since pupils could be tempted to create complicated designs without any purpose. Both user guides are provided with classroom case studies and suggested exploratory activities.

Programs of the quality of *Kaleidoscope* and *Frieze* and the possibilities of exploration they give will ensure that this visual and highly stimulating area of mathematics can be enjoyed by all.

Kaleidoscope *and* Frieze *are published by ESM, Abbeygate House, East Road, Cambridge, CB1 1DB. Tel: (0223) 65445. They are available for the BBC micro and Master series computers and cost £35 each including VAT.*



Frieze – a pattern generating program

IMPRESSION II

• Page rulers • 17 fonts now included

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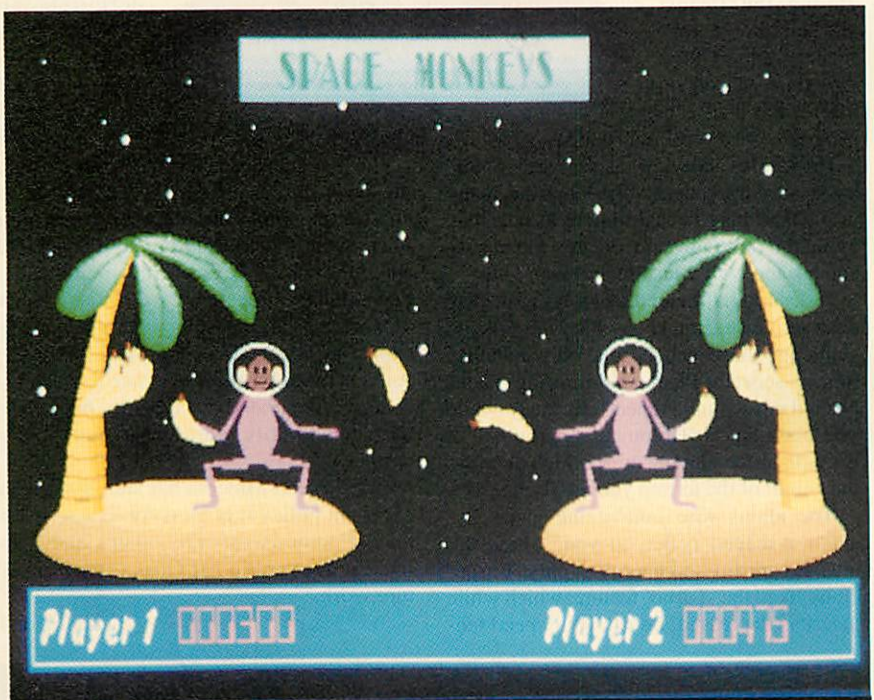
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GAME SHOW



Going bananas with Space Monkeys

I have a couple of niggles this month. First and foremost – delays. When a message is printed on screen, too often it stays there for too long with no means of returning to the game – even though you might have read it a thousand times.

In my view, authors seem to add extra delays just for good measure to ensure enough time to read, digest, ponder and contemplate the message. This is bad enough, but I find it very annoying when whacking the space bar has no effect.

Holed Out is an example – when the golfer tries to kill fish with the ball, a message flashes up at least seven times saying the ball is lost. If there are any authors reading this who are currently masterminding a long delay, give us a break and don't give us a break.

Niggle two concerns only Archimedes games, and it is – Risc OS! Please folks, we like to run things from desktop and return to desktop by pressing CTRL-ESCAPE or the equivalent, not CTRL-BREAK. Some games still require a SHIFT-BREAK to load and then reconfigure the whole machine. Arthur's dead, wake up.

The Fourth Dimension is guilty here, but *Superior Golf* is flawless in this respect. Guiltless too is Alien Images, which has announced free upgrades of *Arcendium* to Risc Os compatibility. Send your old Arthur disc to: Alien Images, 22 Warwick Street, Prestwich, Manchester M25 7HN.

The best news this month comes from the public domain forum. You must have seen the Foster's ad on TV with Burt Lancaster when two businessmen play *Space Monkeys* on the big screen at the end. Well, you've guessed it, an Arc version is on the way – possibly.

For those of you who haven't seen it yet, each player operates a monkey, and each monkey's task is to lob bananas at the other! That's it. As simple as *Pleb Up Pleb Down*, or *Bug Hunter*, but enormous fun. If it does surface, you'll read about it here.

Alien Images, responsible for *All-in Boxing*, has a possible original on its hands. *Starch* is the first game to my knowledge which concerns the exploits of a laundry manager. You must deal with unco-operative machines, evil dryers and tons of mutant underwear! The story is that two managers, Harry and Dave, are forced to work the menial shifts during the night to hang on to their office jobs.

The fun part is finding out what all the buttons, switches, pedals and levers do and foiling the evil Sam (sic). Excellent graphics, good sound and nice samples. *Starch* will be proving that nothing washes whiter at this year's *BAU* show.

There are two more on the way from AI, the first of which is a revamp of *Space Rescue* called *Colony Rescue*. In this you must leave your spaceship in geostationary orbit and fly down to the surface of the planet – while dodging all obstructions – to rescue, destroy and so on. There is also a desktop version of *Bridge* from the fellow who wrote *Black Queen* – a British expert at the game.

A French company called Sisteme is making moves on the Archimedes market. Its first game is called *Ballarena* and is based on *Breakout*. Well, don't give up yet, because it's got a new angle – the bat moves along a circular path all round the bricks! I haven't had much chance to play it yet but it looks good and the company's next game, *Punk & Jump*, (don't ask!) will be on sale in December.

One of the main attractions for gamesters at the *BAU* show this year is *Interdictor II* from Clares. But it might not get away with a monopoly on attention because The Fourth Dimension has sent word of a rival simulator – *Chocks Away*.

According to Steve Botterill at 4D, *Chocks Away* is a 'superb experience' and is 'totally absorbing'. The game is a solid graphical 3D flight sim with an emphasis on dogfights, indeed the game can be played split screen in two player mode. Instead of a super fast jet, the planes in *Chocks Away* are Tiger Moths, which have been souped-up to make them both fun and lethal. In two player mode you can fight the enemy jointly or use your bullets on each other. There are



Starch poses some stiff problems

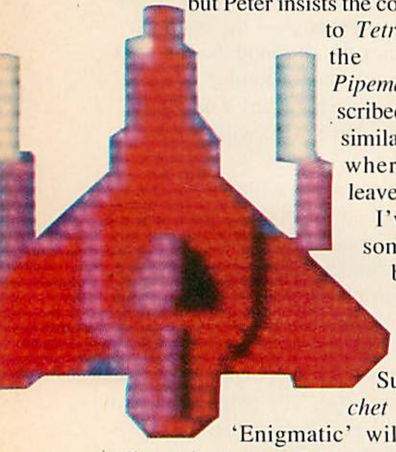
aircraft carriers in the seas, tanks on land, bombers, triplanes, islands, yachts and apparently even rugby pitches! See you at the show to check this one out!

Incidentally, if you're planning to buy either *Arcade Soccer*, *UIM*, *Quazer* or *White Magic* from 4D, then don't. Buy instead *The Real McCoy*, which is a compilation of all four for the price of one.

Later this year 4D will be releasing a 3D snooker game, probably called *Break 147*. It'll be interesting to see how the potential clash with the forthcoming *3D Pool* by Orlando turns out.

As I mentioned last month, a top company has saved the game, which is absolutely excellent, from extinction-before-release. Watch out for an autumn launch.

Orlando has been busy lately with a game called *Loopz* for Beeb and Arc which will be released soon by Audiogenic Software. Peter Calver at ASL describes *Loopz* as 'like *Tetris*, but better'. The idea is to use pieces which become available one at a time to construct a loop on screen. The bigger the loop, the more points – but there must be no overlaps and no spare pieces. In this respect, it sounds a bit like *Pipemania*, but Peter insists the concept is closer to *Tetris*. Mind you the author of *Pipemania* once described his game as similar to *Tetris*, so where does that leave us?



I've been sent some passwords by Robert and Ben Davis of Caterham in Surrey. In Superior's *Ricochet* the password 'Enigmatic' will get you to dimension two, and the passwords for 4D's *Nevryon* are as follows: 'Archie', 'Stereo', and 'Rebel'. These should help you advance in these excellent games.

I've been playing *Inertia* on the Archimedes. It's good fun, but I found myself cursing at the short pauses every few seconds while the screen scrolls. I think they spoil what would otherwise be a very enjoyable game. My favourite game of all time is *Marble Madness*, and I'm sure something could be done to improve the scrolling in *Inertia* to bring it a bit closer to my dream! Pokes on a postcard to Game Show...

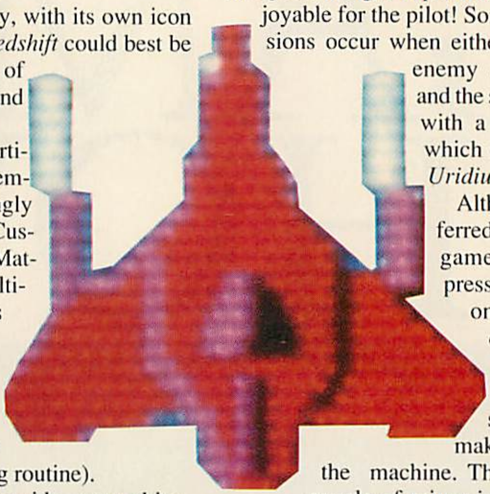
One last word. Please stop sending requests for help with Superior's *Exile* – it's killing me and the postman! Instead, keep an eye on forthcoming issues.

Sam Greenhill

Redshift!

Minerva (0392) 437756
Archimedes £17.95

Looking very snazzy, with its own icon and 3D stars galore, *Redshift* could best be described as a hybrid of *Firetrack*, *Psycastria* and *Syncron*.



It is essentially a vertically-scrolling shoot-em-up from the intriguingly named Daniel Goss-Custard, with graphics by Matthew Taylor. The multi-speed scrolling is among the fastest and smoothest yet to be seen on the Arc (but then again it isn't too difficult to program a fast scrolling routine).

Ridiculous storyline aside, your objective is to comprehensively destroy as many of the land-based constructions as possible, avoid the raised ground, destroy the nasties and escape with your life and your ship.

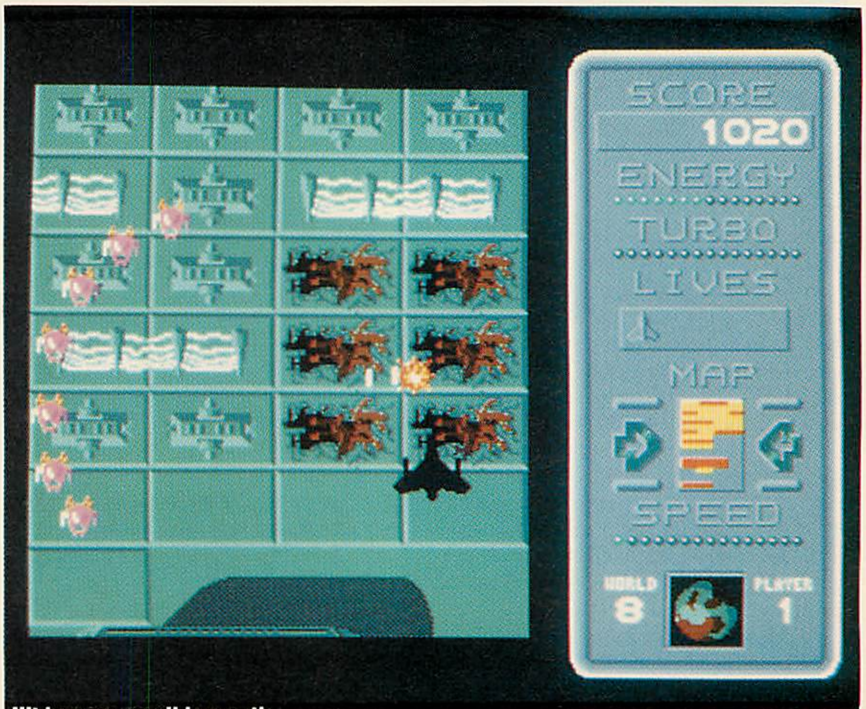
If desired, at the end of each mindlessly destructive strafing session, a *Zalaga*-style challenge stage can be played and bonus points scored. Pleasant-sounding background music tinkles cheerfully away while you play, and a 'Holomap' is provided at the side of the playing area, which displays the height of the terrain you are flying over.

The aliens who inhabit the game fire small x-shaped pellets at you, which decrease your limited energy supply. I especially liked the 'Turbo' feature, which while SPACE is depressed, boosts your speed tenfold and looks quite stunning, although smashing into buildings at somewhere near the speed of light is probably less than enjoyable for the pilot! Some nifty explosions occur when either you or your enemy are destroyed, and the ship turns about with a deft little flip which reminds me of *Uridium/Psycastria*.

Although I have referred to some BBC games to best express the feel of this one, *Redshift* is definitely an Archimedes game in essence, and makes good use of the machine. There are only a couple of minor irritations. First, the cursor keys, ALT and SPACE are used to control the ship – not a good combination for a game which requires fast reactions, and the control keys are not redefinable. Second, there's no password system, which most seasoned games players have come to expect as standard on multi-level releases. A cheat mode exists to alleviate this and recharges energy and turbo banks, but I have been temporarily worn to secrecy – only temporarily!

Once again, Minerva has shown what an excellent policy it is for software houses to release games written by others, and I am looking forward to Mr Goss-Custard's future work.

Mat Tizard



Hit 'em up, scroll 'em out!

Dennis Wheatley 'Herewith the Clues'

Actual Screenshots/CRL. Tel: (081) 533 2918
Archimedes £24.95

From the same team that brought you the 3D tank battle (*BAU* August issue), namely Cupit and Cruse, comes an innovative and engaging new type of game.

The Dennis Wheatley of the title was a popular crime writer of the 30s who came up with the original idea of supplying all the relevant information and evidence anybody might need to solve a murder mystery in document form, as opposed to the conventional paperback novel format.

The authors have taken Wheatley's concept one stage further and digitised the contents of the folder, compressed the resulting images so that they fit onto two discs, and added a sample or two.

All the information is cross-referenced and is called up by clicking on it with a magnifying glass pointer – if you want to see the contents of a letter, click on its address, and so on.

In the role of detective, you weigh up all the data, scrutinise every shred of evidence and eventually reach a decision about who killed Serge Orloff. It is essential to take notes as you sift through the mounds of digitised paper extracting the useful facts from the rest of the information.

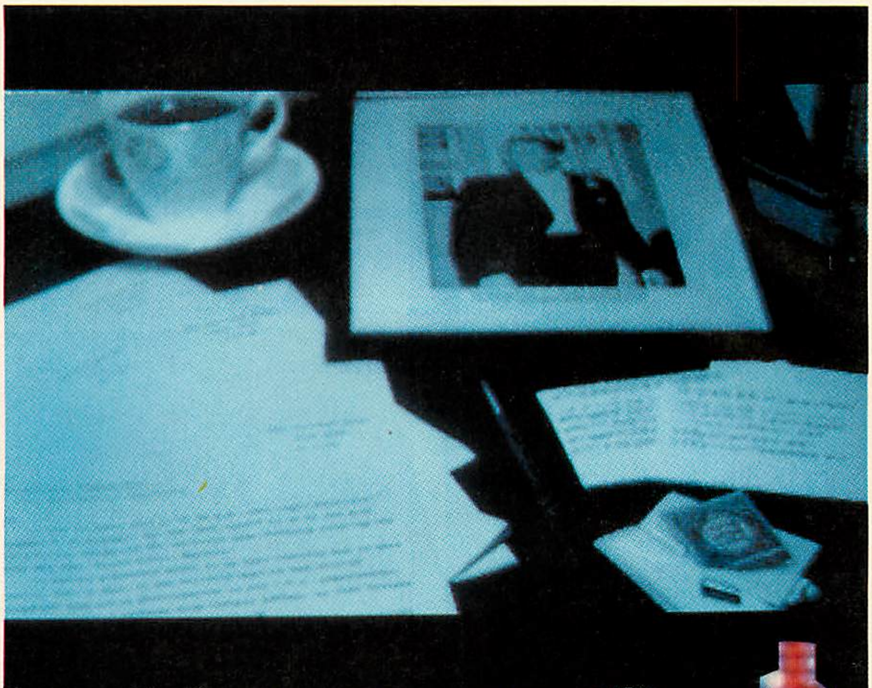
There is a mysterious terrorist connection to the murder and plenty of dirty linen has to be washed before the true chain of events leading to the killing can be followed.

I'm not going to reveal any more of the storyline and spoil your enjoyment. Once you think you've correctly solved the mystery, you can write to the publisher who will furnish you with the full solution.

The game's presentation and ease of use are both excellent; the screen fades in and out with each new document and a sampled voice tells you when a disc change is required. There are no explosions or aliens of any kind in the game and the atmosphere of intrigue is created purely through the semi-literary style of writing which the policemen all seem to have!

The fact that everything is in black and white contributes to the sense of period which the game manages to convey well.

Mat Tizard



Sometimes things have to be seen in black and white

Superior Golf plus Construction Set

Superior Software. Tel: (0652) 58585
Archimedes £19.95

Superior Golf is the third golf game on the scene in just over a year. *Leaderboard* and *Holed Out* surfaced first, followed by extra holes plus a course designer for the latter – *Leaderboard* copped out there and then, though to be fair it does have a very limited hole designer.

But Superior's version comes complete with six courses and an extensive hole and course designer, hence the sub-title 'construction set'.

In play it is reminiscent of *Leaderboard* and the graphics are not altogether different. Of the three, *Golf* has the best club selection process.

It is possible to test the range of each club before actually striking the ball, which deflects off trees quite realistically. All the usual samples for swinging, whacking, dropping and plopping are here.

Superior Golf has proper hook and slice, as did *Leaderboard*, with one annoying feature – when clicking on the power meter to commence a wing, should you lightly miss, the crosshair is displaced completely unless you intend your ball to fly off at right angles!

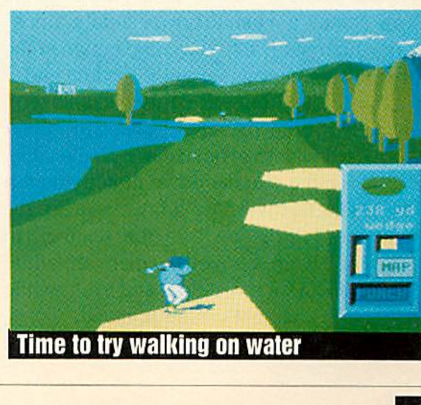
On the subject of crosshairs, they don't seem to represent the angle of deflection very accurately. The ball should fly off roughly along a straight line drawn between the golfer and the cross, which it doesn't. But apart from these grumbles, *Superior Golf* plays a good game, on par with *Holed Out*, though both have the same bug – it's possible to make the golfer stand on water!

The hole designer is as good as the *Holed Out* one, though both could be better. In neither can proper flood-filled areas be plotted – to create a 'doughnut' shaped lake you have to build up a series of square lakes in a circle, because if you do it the logical way the whole area is filled, including the hole in the middle!

However, it is possible to create what you want with a bit of patience. The course designer allows holes to be shuffled around, with good diagrams showing the rough features of each hole, though I would have liked to 'drag' holes about using the mouse.

All in all, *Superior Golf* scores higher than *Leaderboard* and is on an even par with *Holed Out*. For purely aesthetic reasons I think I prefer the *Holed Out* play, but technically *Golf* has more features, without the extra expense of a designer.

Sam Greenhill



Time to try walking on water

FLASH IN THE SCAN

The first colour scanner for the Arc is with us. **GRAHAM BELL** checks it out



An original 'snapshot'...



...and the scanned version

Colour scanning has arrived, in the shape of the Irlam I-mage. Irlam Enterprises is well-known for its monochrome scanner, the I-scan, a motorised 16-grey level, 200dpi scanner that's the acknowledged Rolls-Royce among Arc scanners. But while the I-scan is designed and built by Irlam, the I-mage colour scanner uses an existing Sharp colour scanner – only the podule interface and software are new.

The I-mage is based on the Sharp JX-100, which is capable of scanning at a resolution of about 200 dots per inch, and of differentiating 64 shades of red, green and blue (it scans eight bits per pixel, giving 256 shades of each colour, but only six bits of the colour information are accurate). In theory, this represents a possible 262,144 different colours. The JX-100 is a Kleenex-box sized grey lump with neither controls nor switches, just a single power and data cable that goes to the Irlam podule fitted to your Archimedes. The podule fits easily into any 400-series machine, or a 310 with a backplane. It will also work in an A3000, via the external podule connection on the rear. There's a separate power supply 'brick' too, which plugs into the cable between the podule and the scanner at the podule end.

The top and bottom of the scanner box are mostly transparent. You put the postcard-sized picture to be scanned on the table, then place the scanner down directly on top of it. The top window allows you to see right through the body of the scanner, to align the picture correctly – there are white lines marked on it to help – and to show the maximum area that can be scanned.

Anyone who's seen the I-scan software will find the operation of the I-mage simple. It's totally software controlled; there's not even an on/off switch. The application installs itself on the icon bar, and when activated opens two windows. One is a view of the scanned sprite – initially blank – and the other is the control panel. This allows you to graphically select the area to be scanned, change the resolution and so on, then start the scan.

A scanned postcard-sized image (6in by 4in) can occupy anything up to a megabyte. And the connection between the scanner and podule is essentially a fast serial cable. So it's no surprise that scanning even a small image can take 10 minutes. The motorised scanner makes three passes – it has only one sensor, and a white florescent lamp coupled with three red, green and blue filters – and each pass is quite slow as it sends data back to the Arc.

The software assembles a large file containing the red, green and blue data for each pass – this is the raw 24-bits per pixel information. This file can be up to 3Mb in size, so there's no doubt that you need a hard disc. But the Arc cannot display all the 262,144 possible colours in the image. The main program code of the *ChangeFSI* application (which is now available separately from Wild Vision) is used to reduce the filesize, and change the 24-bit colour image to a mode 21 sprite.

ChangeFSI uses dithering to mix up the required colours from the 256 available on screen, but of course in the process loses some of the fine details in the 24-bit image.

It's important that the scanner software allows you to select between 100 and 200dpi resolution (or indeed any other resolution you select up to about 240dpi), so you can do a quick low-res scan, then select just the area of interest so the high-res scan is quicker. But speed isn't the only reason – as the high-res scans take up so much memory, this low-res preview allows the I-mage to be practicable in a 2Mb machine. There's no way to handle such large scanned sprites in a 1Mb machine.

Once the image is converted, it may be saved as a normal mode 21 sprite; typically this is about a megabyte in size.

Comparing the screen image of the scanned sprite with the original coloured photograph shows the on screen colours to be too saturated and too dark – beige becomes khaki, sky becomes too blue, faces end up a bright shade of pink – with the monitor adjusted normally.

Handling colour on screen in this way will never be reliable on the Arc anyway: monitors vary, and without any way of calibrating them, the on-screen version can never be true to the original.

Similar problems afflict colour printers. The software makes no attempt at colour correction of the image, and there's no hardware adjustment either. This is an area that Irlam should consider developing.

I can see this scanner appealing in particular to schools who have Integrex colour printers attached to their Arcs. But the printed results from a coloured scan are disappointing. This sort of colour work just cannot be done both cheaply and well, and a more expensive printer is necessary to get the best results. Bear in mind too that you need a powerful Arc: a hard disc and plenty of memory is vital. And if you habitually work in a 256-colour mode, an Arm 3 upgrade would speed the machine up immensely. Criticism must be levelled at the I-mage in that the software doesn't make full use of the hardware. The Sharp scanner is capable of scanning 256-grey level images, yet there's no provision for this in the software. Although the Arc cannot display such images (it's limited to 16 greys), they could be used in desktop publishing as the Acorn printer drivers distinguish at least 64 shades of grey.

However, this is the first Arc colour scanner. I suspect that better colour devices will arrive before 1990 is out, but Irlam has a working scanner now. It works reliably, and while the colour fidelity of the scanned images is not good, it is remarkably inexpensive and well designed.

I-mage colour scanner, £689, Irlam Instruments, 133 London Road, Staines, Middlesex TW18 4HN.

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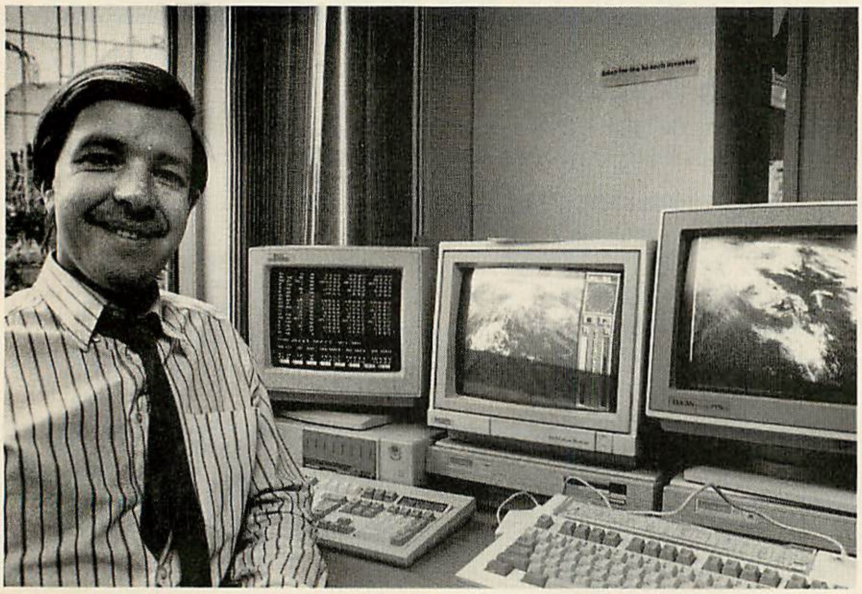
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WEATHER STATION

CHRISTINA NEAL learns how the Archimedes plays a leading role in the forecasting of Britain's weather



'Certainly for the rest of the day it will stay warm and hazy so now's as good a time as any... '

Philip Eden replaces the receiver at his Luton home with a smile. 'That was the sales department at Capital Radio.

'They're doing an ad for one of those pollen hayfever products and wanted to know the right time to run it.

'With the weather being so muggy at the moment, they couldn't have picked a better time than now.'

He swings his chair around to face a desk littered with paperwork containing notes and information relating to the weather.

An Epson printer is busy spilling out a weather map, but it is the Arc 440 machine and its display of the temperature in every major British city that immediately grabs the eye. Philip points to the comprehensive set of figures proudly.

'This is a database containing all the statistics on it that enables me to tell you that the temperature in Newcastle on a certain date was X degrees.'

It is such detailed information that has allowed Philip to make his living as an independent weather forecaster for the past decade.

Intrigued by the weather from an early age ('I used to cut out weather maps as a child') he refused to take the 'normal route' of entry by joining the Met Office.

Instead, he studied meteorology at University, before trekking to North Sea oil rigs to provide forecasts to the workers whose safety would often depend on his accuracy.

Although his route to success has been slightly different from your average Ian McCaskill, his accurate forecasts are in great demand.

He writes scripts for Capital Radio, LBC and Radio Bedfordshire. He also pens weather summaries for *The Sunday Telegraph* and *Today* newspaper.

In addition, he makes predictions for film companies who 'need to know when it won't rain so that they can film their scenes without interruption!'

Obviously, the Arc's role in revealing temperatures in specific areas is very useful, but it doesn't stop there.

Philip uses his 440 machine for writing his forecasts and sending the finished copy to radio stations and newspapers over a Tricom modem. It also gives him access to Weather Services Incorporated (WSI), an American databank containing worldwide weather information.

But most importantly, Philip uses an Arc 420 machine in conjunction with his satellite equipment for the actual preparation of his forecasts.

He receives basic information on satellite radio equipment from the weather chart produced on his Epson machine. The actual information on the map is transmitted from German radio airwaves.

'The crackles that come in represent a signal that is converted into digital format,' he says. 'Then my receiver tells me what the weather is doing all over the world.'

Combined with his direct link to WSI, this equipment enables Philip to prepare an outline of his forecasts.

But he also relies on his Arc 420 in conjunction with Spacetech's 'Electronic Weather Station' software, which provides a kit consisting of two receivers, a podule and an antenna.

'The Spacetech software is very flexible,' he says. 'It enables me to pick up each picture as it comes in and zoom in on a small area to study it in more detail if I want to.'

In addition, Philip can add artificial colours to certain areas and change the grey scales to enhance colour contrast. This enables him to gain a more clear-cut picture of the satellite.

These extra facilities all play a part in enabling him to make his forecasts as accurate as possible.

As a result, the future looks very rosy. He says he is currently overwhelmed with work. Philip is about to commence providing forecasts for a new weather programme starting on BSB's 'Now' Channel at the end of the month.

Although there will be scope for an occasional TV appearance, his main task will be to write the weather scripts.

But is he never envious of the forecasters who appear in front of the TV cameras on a daily basis?

'Not really. I think that the TV weatherman is often considered a bit of an Aunt Sally because they can sound as if they're predicting all kinds of things.

'They often say things like "it could do this, or it may do that." But I can give people a more specific forecast by telling them, for instance, that "there's a 60 per cent chance of a shower" – and I have my hardware and software to thank for that.'

The Electronic Weather Station is available from Space Technology, 21 West Wools, Portland, Dorset DT5 2EA. Tel: (0305) 822753.
The Arc version costs £1240 and the A3000 is priced £1285.

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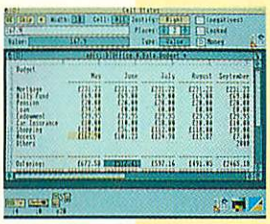
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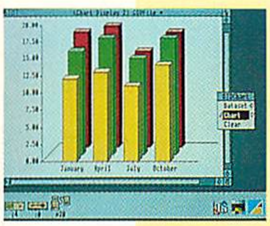
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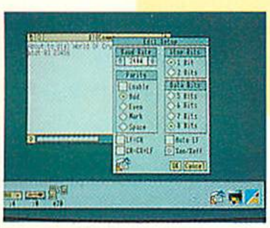
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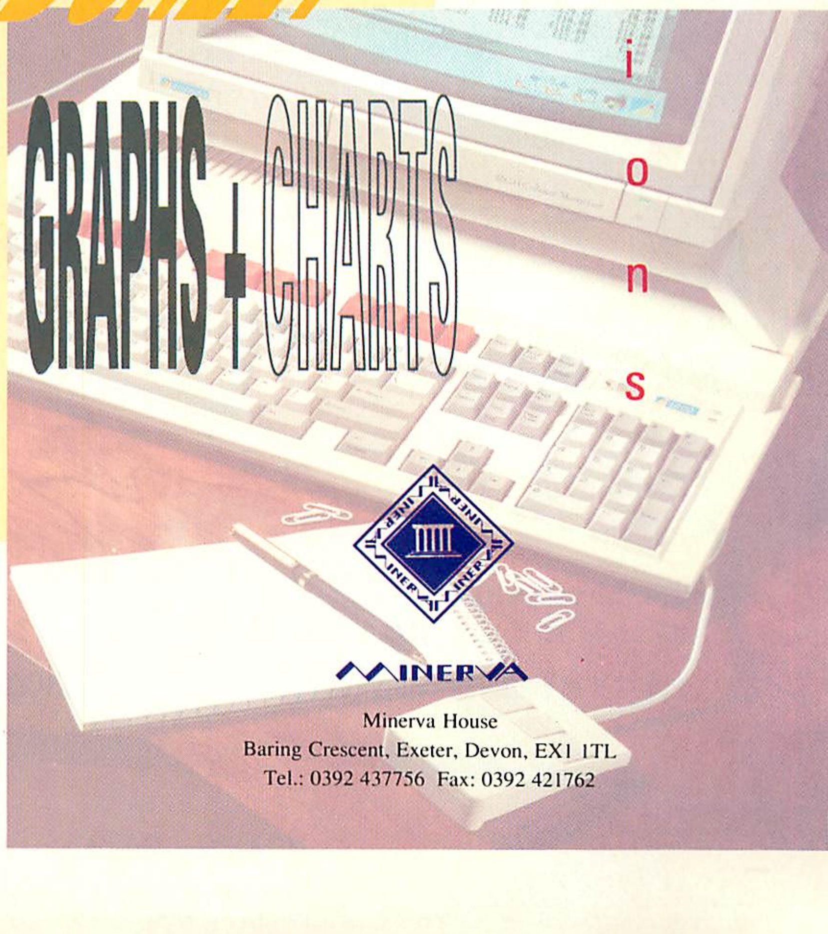
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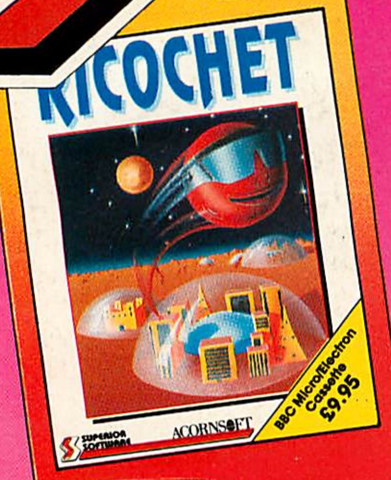
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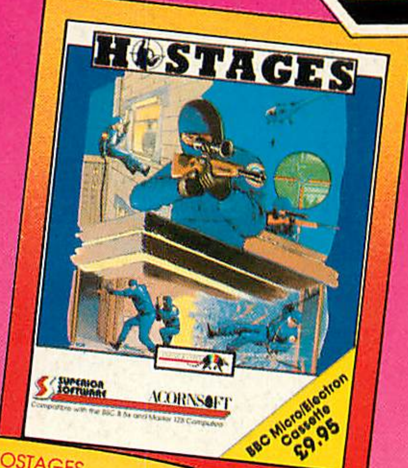
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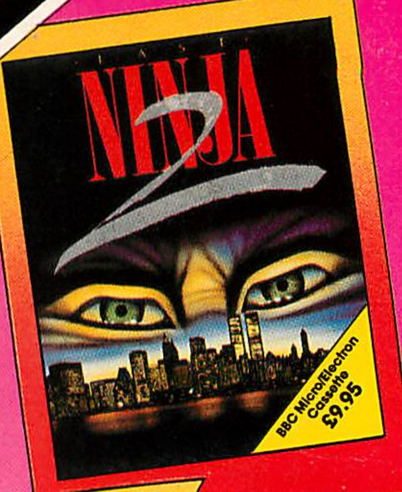
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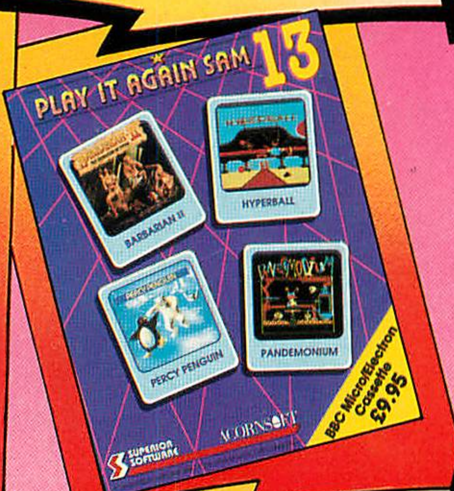
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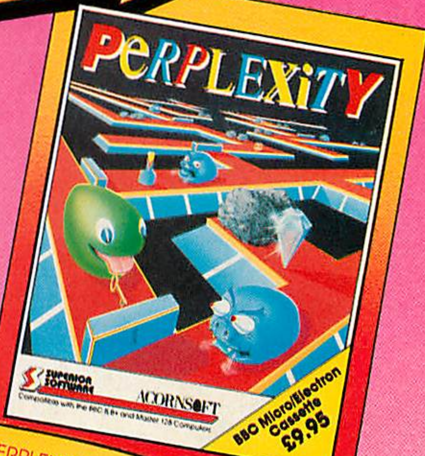
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